RF Project 762647/713729
Final Report
Volume II

the
ohio
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research foundation

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USE OF COMPUTER-AIDED TESTING IN THE INVESTIGATION OF PILOT RESPONSE TO CRITICAL IN-FLIGHT EVENTS

VOLUME II - Appendix to Final Report

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Industrial and Systems Engineering

For the Period
April 1, 1981 - September 30, 1982

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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Final Report

Use of Computer-Aided Testing In The Investigation of Pilot Response To Critical In-Flight Events

Volume II - Appendix To Final Report

Supported By:

National Aeronautics and Space Administration
Ames Research Center
Moffet Field, California 94035
NAG 2112

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Principal Investigators:

Thomas H. Rockwell

and

Walter C. Giffin

FOREWORD

This report is prepared in two volumes. Volume I reports the findings of the research. Volume II contains the Appendices to the final report. The appendices contain detailed documentation of the tools used to conduct the research. This includes a sample set of displays presented to subjects during computer aided testing, a set of experimenter instructions necessary to operate and modify the programs and a table of contents on the 1981 Symposium on Aviation Psychology supported by this grant.

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Volume II

Appendices A Through E

Computer Aided Testing Displays

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Appendix A

Illustrations of PLATO® Displays

The attached exhibit depicts a small sample of the material presented to the subject pilot by the PLATO® terminal. The displays selected for presentation here represent different facets of the program, e.g., sample biographical questions, sample knowledge test questions or a representative diagnostic scenario. The illustrations represent a sample of those presented to the subject in his response to:

1) Fifteen biographical questions
2) Twenty knowledge questions
3) Six scenarios

CRITICAL

IN-FLIGHT

EVENTS

Developed by: The Ohio State University
Department of Industrial Engineering
under a research grant from NASA/AMES

Principal Researchers: Dr. T.H. Rockwell
Dr. W.C. Giffin

Programmer/Analyst: Jeffrey Lee

Assistant Programmer: Steve Schoenlein

PLATO Consultant: Dave Romer

(Touch the screen anywhere to begin.)

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INTRODUCTION

Thank you for being a subject in this NASA supported research project.

The scenarios you are about to see were developed not as a device to test your flying expertise, but rather as a mechanism for us to better understand how pilots might react to certain situations.

For many of the flying situations presented (just as in real life), there are no obvious answers. What we want to find out is how you approach problem solving. These are not games in the sense that you compete with the computer or anyone else. We hope you will find the scenarios to be realistic situations a pilot must occasionally confront. For the most part, the scenarios are not dynamic ie. the instrument panel does not reflect changes over time. In effect the terminal acts not like a flight simulator, but rather as a device to present information so we can understand pilot diagnostic and decision making behavior.

CIFE Router

Biographical Survey	Diagnostic Scenario #Ø1	Destination Diversion Test
Knowledge Survey	Diagnostic Scenario #Ø2	Airport Ranking Test
VOR-Autopilot	Diagnostic Scenario #Ø3	
	Diagnostic Scenario #Ø4	
	Diagnostic Scenario #Ø5	
	Diagnostic Scenario #Ø6	

Stop Testing

Data Display

BIOGRAPHICAL DATA

Touch the screen anywhere to begin the biographical survey.

Question No. 1

Enter Pilot Certificate by Touch Panel

$\boxed{\text{a)}}$ Student Pilot

b) Private Pilot

c) Commercial Pilot

d) Air Transport Pilot

When you have made your final SELECTION:

$\boxed{\text{ENTER}}$

Question No. 2

Enter Airman Ratings Held by Touch Panel

a) Repairman

b) Airframe Mechanic

c) Powerplant Mechanic

d) Flight Engineer

e) Instrument Rating

f) Certified Flight Instructor

g) ASEL

h) AMEL

i) Rotary Wing

j) Inspection Authorization

k) None of the above

FINAL finalizes above entries.

FINAL

ERASE removes last entry.

ERASE

KNOWLEDGE SURVEY

Touch the screen anywhere to begin the knowledge survey.

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Question No. 1

What is the standard adiabatic lapse rate?

$\boxed{\text{a)}}$ 2°F per 1000 feet.

b) 2.5°F per 1000 feet.

c) 3°F per 1000 feet.

d) 3.5°F per 1000 feet.

e) 4°F per 1000 feet.

When you have made your final SELECTION:

$\boxed{\text{ENTER}}$

Question No. 2

Do the indications of a normally operating alternator system change during the course of a flight? (Assume charge-discharge ammeter)

a) Yes: Ammeter shows more charge when electrical equipment turned on.

b) Yes: Ammeter shows less charge when electrical equipment turned on.

c) After engine start, the ammeter shows a higher than normal rate of charge and gradually declines to normal rate.

d) No, does not change.

When you have made your final SELECTION:

ENTER

Your total score for this test was:

SCORE = 25%

You missed questions in the following areas:

AREA	Total Missed	Total In Area
I. Engine and fuel systems	5	7
II. Electrical systems and cockpit instrumentation	5	7
III. Weather and IFR operations	5	6

Touch the screen anywhere to exit Knowledge Survey.

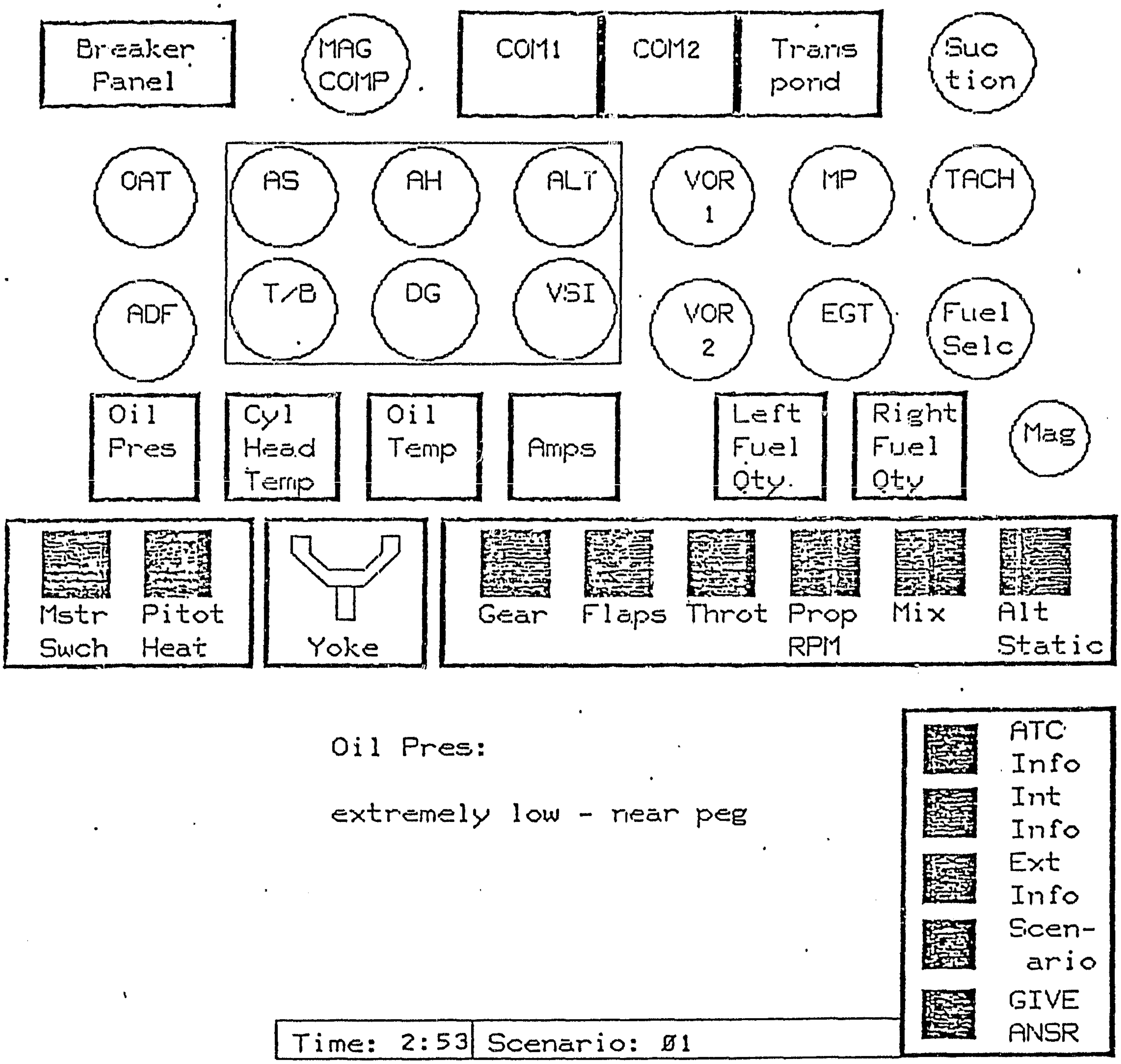
DIAGNOSTIC SCENARIO TEST

Instructions:

You have a maximum of 4 minutes for each diagnostic scenario. Since these are potential emergency situations, please answer the question as soon as you feel that you have a solution.

Please press CONTINUE when you are ready to start the test.

CONTINUE


Breaker Panel
MAG COMP
COM1
COM2
Transpond
Suction
OAT
AS
AH
ALT
VOR 1
MP
TACH
ADF
T/B
DG
VSI
VOR 2
EGT
Fuel Selc
Oil Pres
Cyl Head Temp
Oil Temp
Amps
Left Fuel Qty.
Right Fuel Qty
Mag
Mstr Swch
Pitot Heat
Yoke
Gear
Flaps
Throt
Prop RPM
Mix
Alt Static
Oil Pres:
extremely low - near peg
ATC Info
Int Info
Ext Info
Scenario
GIVE ANSR
Time: 2:53
Scenario: Ø1

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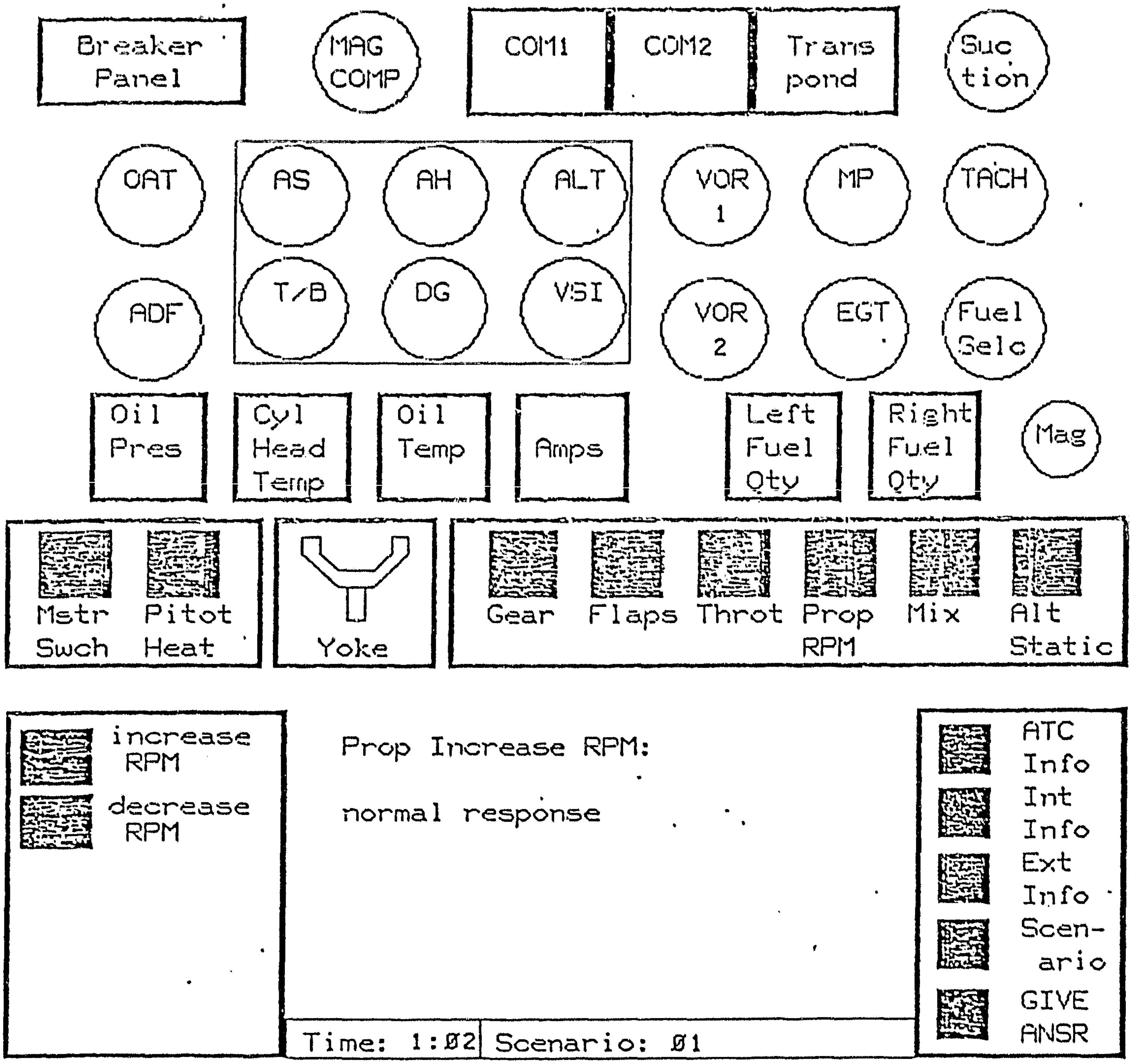

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Information for External Conditions

Cowling Condition

Windscreen Condition

Wing Condition

Flap Condition

Aileron Condition

Stabilizer Condition

Cowling Condition:

clean and secure

ATC Info

Int Info

Instr Panel

Scen-ario

GIVE ANSR

Time: Ø:15 | Scenario: Ø1

Information for Inside Cabin Conditions

Cargo Condition

Door Condition

Panel Temp Condition

Cabin Temp Condition

Housekeeping Condition

Smoke

Fluid Leaks

Noise & Vibration

Fluid Leaks:

oil droplets on floor.

Instr Panel

ATC Info

Ext Info

Scen-ario

GIVE ANSR

Time: 3:10 | Scenario: 01

ATC Information for Diagnostic Purposes

Ceiling

Visibility

Cloud Tops

Winds Aloft

Freezing Level

PIREPS

SIGMETS

AIRMETS

Ground Speed

NAV AID Status

Freezing Level:

area forecast-
8ØØØ

Instr Panel

Int Info

Ext Info

Scen-ario

GIVE ANSR

Time: 2:13	Scenario: Ø1

▩	Instr Panel	▩	ATC Info	▩	Int Info
▩	Ext Info	▩	Scen- ario	▩	GIVE ANSR

You have chosen GIVE ANSWER.
If you are ready to give your
diagnosis of the scenario,
please touch the GIVE ANSR
button; else touch an alternate
button to continue the test.

Time: 1:57	Scenario: Ø1

Question No. 1

To help you arrive at key words in your diagnosis we have prepared a list of words, a lexicon, from which you can describe your diagnosis.

Do you wish instructions in the operation of this lexicon?

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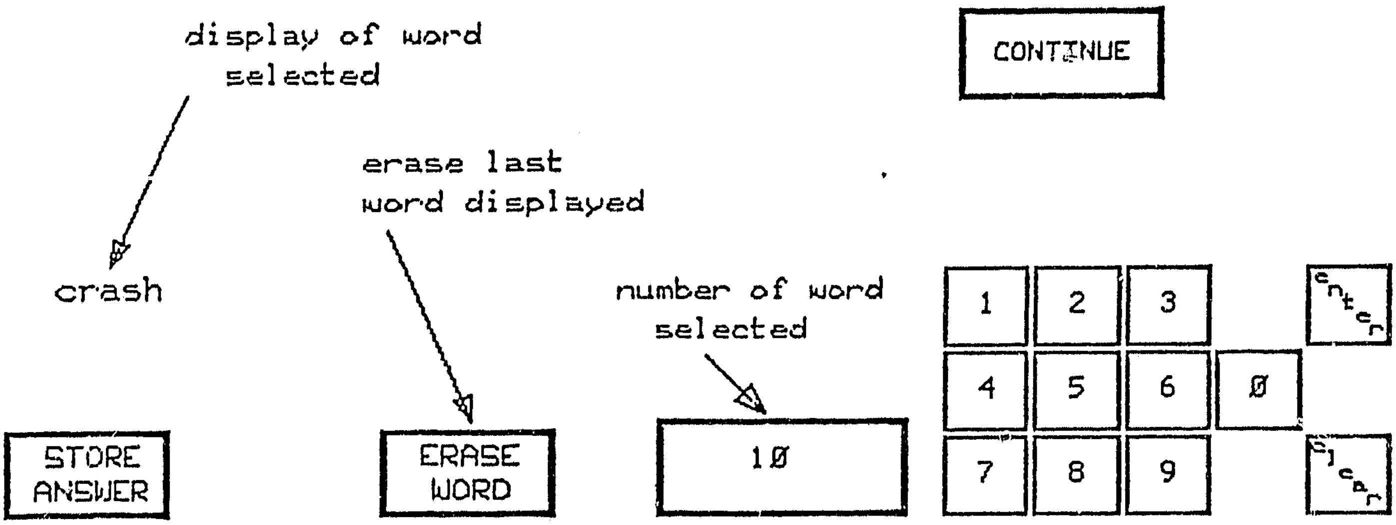
Question No. 1

What do you think is the cause of the problem?

Instructions for answering this question:
Below is an example of the list of words
and the keyboard.
Notice that word 1Ø was selected and
entered.

8 airport
9 bush
1Ø crash
11 dice
12 farm

Please touch -CONTINUE- to start selecting words.



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1	aileron	26	elevator	51	landing	76	rudder
2	alternator	27	engine	52	latch	77	screen
3	altimeter	28	exhaust	53	leaking	78	screw
4	baffle	29	failure	54	left	79	seal
5	battery	3Ø	filter	55	line	8Ø	seizure
6	belt	31	fire	56	loose	81	smoke
7	blocked	32	flap	57	loss	82	starter
8	bottom	33	flow	58	lost	83	starvation
9	broken	34	fouled	59	magneto	84	static
1Ø	burst	35	frozen	6Ø	mixture	85	stuck
11	cable	36	fuel	61	motor	86	suction
12	cap	37	gasket	62	oil	87	switch
13	carburetor	38	gauge	63	partial	88	tank
14	C/B fuse	39	gear	64	pedal	89	temp.
15	cock	4Ø	govenor	65	piston	9Ø	throttle
16	complete	41	gyro	66	pitot	91	tip
17	condenser	42	heat	67	plugs	92	top
18	control	43	hot	68	points	93	vacuum
19	cold	44	hydraulic	69	popped	94	valve
2Ø	cowling	45	ice	7Ø	port	95	vapor
21	crankshaft	46	ignition	71	pressure	96	vibration
22	cylinder	47	induced	72	prop		
23	door	48	induction	73	pump		
24	drive	49	instrument	74	right		
25	electrical	5Ø	jets	75	ring		

oil gauge line
leaking

1	2	3		enter
4	5	6	Ø	
7	8	9		clear

STORE ANSWER

ERASE WORD

Question No. 2

Barring any other problems, how long would you be willing to fly the airplane?

a) Ø - 5 minutes

$\boxed{\text{b)}}$ 5 - 3Ø minutes

c) as long as fuel permits

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When you have made your final SELECTION:

$\boxed{\text{ENTER}}$

Question No. 3

Barring any other problems, how serious is the problem?
(1 is the least critical and 7 is the most critical)

a) 1

b) 2

c) 3

d) 4

e) 5

f) 6

g) 7

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When you have made your final SELECTION:

ENTER

Question No. 4

How confident are you about your diagnosis?
(1 is the least confident and 10 is the most confident)

a)	1	f)	6
b)	2	g)	7
c)	3	h)	8
d)	4	i)	9
e)	5	j)	10

When you have made your final SELECTION:

ENTER

Question No. 5

Barring any other problems, how long would
you be willing to fly the airplane given our diagnosis?

a) Ø - 5 minutes

b) 5 - 3Ø minutes

c) as long as fuel permits

When you have made your final SELECTION:

ENTER

Question No. 6

Barring any other problems, how serious is the problem given our diagnosis?
(1 is the least critical and 7 is the most critical)

a) 1

b) 2

c) 3

d) 4

e) 5

f) 6

g) 7

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When you have made your final SELECTION:

ENTER

Appendix B

Description of Diagnostic Scenarios 1, 2, 3, 4, and 6*

*Scenario #5 is found in Figure 7.

Scenario

You are making a day trip from Albany,NY to Burlington,VT. You fly out of Albany at 9:00am, cleared Victor-91, Burlington. You climb to a cruising altitude of 7000ft. After 20 minutes of routine IMC flying you notice the smell of engine oil.

How would you diagnose the problem?

Instr Panel	
Int Info	
Ext Info	
ATC Info	
GIVE ANSR	

Time:	Scenario: 01

Our diagnosis of the problem was the following:

A small crack developed in the oil line feeding the oil pressure gauge. This crack reduced the oil pressure reading drastically, but did not seriously affect the actual lubrication of the engine. A small pool of oil began to form on the floor of the cabin, pilot's side. Assuming that the cracked line would not deteriorate quickly into a complete break, you were in no immediate danger of engine seizure.

CONTINUE

Scenario

You are making a day trip from Augusta,ME to Lebanon,NH.You fly out of Augusta at 9:00 am,cleared Victor 39 to Neets intersection, Victor 496 to Lebanon.You climb to a cruising altitude of 6000 ft.After 15 minutes of routine IMC flying in instrument conditions,your instruments indicate an increase in airspeed and steadily decreasing altitude while maintaining level flight attitude.

How would you diagnose the problem?

Instr Panel

Int Info

Ext Info

ATC Info

GIVE ANSR

Time:	Scenario: 02

Our diagnosis of the problem was the following:

Your vacuum pump failed as indicated by the low reading of the suction gauge. The vacuum pump drives the attitude and directional gyros.As the artificial horizon lost its drive it started to sag to the right and you compensated by turning left,leveling the artificial horizon and putting the plane in a slow, descending left bank.The airspeed increase was due to the slight nose-down attitude.

CONTINUE

Scenario

You are making a day trip from Keene,NH to Montpelier,VT. You fly out of Keene at 10:30 am, cleared Victor-151 to Montpelier. You climb to a cruising altitude of 5000 ft. After 20 minutes of routine cruise in IMC your engine suddenly starts running extremely rough, shaking the whole plane and losing about 20% of its cruise power.

How would you diagnose the problem?

Time:	Scenario: 03

Instr Panel

Int Info

Ext Info

ATC Info

GIVE ANSR

Our diagnosis of the problem was the following:

Your engine suffered a broken drive gear in the right magneto. The resultant untimed ignition conflicted with the remaining good ignition and caused the extremely rough engine and backfiring. Switching from 'both' to the left magneto would have resulted in a smooth running engine with slightly less power than normal cruise.

CONTINUE

Scenario

You are making a day trip from Sanford,ME to Messena,NY. You fly out of Sanford at 8:30am, cleared Victor-496 to Lebanon, Victor-141 to Messena You climb to a cruise altitude of 6000. After 20 min IMC flying, Boston Center instructs you to climb and maintain 10,000ft.You acknowledge and begin your climb between layers.After 2 min of climb,you notice your indicated airspeed dropping off steadily from 100kts, maintaining constant pitch attitude.

How would you diagnose the problem?

Instr Panel
Int Info
Ext Info
ATC Info
GIVE ANSR

Time:	Scenario: 0.4

Our diagnosis of the problem was the following:

As you climbed through 6500ft, the static port froze over as the outside air temperature dropped below 32°F. This caused the airspeed indicator to decrease as altitude increased and the VSI and altimeter to read low. Several corrective actions were possible: return to your previous altitude of 6000ft; open the alternate static source; break the VSI glass.

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CONTINUE

Scenario

You are making a day trip from Augusta,ME to Lebanon,NH. You fly out of Augusta at 10am, cleared Victor 39 to Neets Intersection, Victor 496 to Lebanon. You climb to a crusing altitude of 8000ft. After 20 minutes of routine flying in instrument conditions with light to moderate turbulence, you notice that increased nose-up trim is required to maintain a constant indicated altitude and that your IAS has decreased 20kts from normal cruise.

How would you diagnose the problem?

Instr Panel

Int Info

Ext Info

ATC Info

GIVE ANSR

Time:	Scenario: 05

Our diagnosis of the problem was the following:

A baffle was broken in the muffler. The broken baffle partially blocked the exhaust system causing increased exhaust backpressure. The increased exhaust backpressure absorbed a portion of the available horsepower output from the engine. With a constant throttle setting, the prop flattened pitch to maintain constant RPM causing a decrease in airspeed while altitude was held constant. Conversely when airspeed was held constant altitude decreased due to reduced power output available at the propeller. Increasing the manifold pressure with added throttle permitted enough power to be developed to maintain altitude at a greatly reduced airspeed.

CONTINUE

Scenario

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You are making a day trip from Montpelier.VT to Bangor.ME with two passengers on board. You fly out of Montpelier at 1:00pm. cleared radar vectors to Wylie intersection. direct Augusta, Victor 3 to Bangor. You climb to a cruising altitude of 9000ft. After 30 minutes of routine flying in instrument conditions with light to moderate turbulence. one of your passengers reports smelling a faint burning odor. You are unable to detect the odor because you have a head cold.

What is the first thing you would do?

Instr
Panel
Int
Info
Ext
Info
ATC
Info
GIVE
ANSR

Time: Scenario: 06

CONTINUE

Our diagnosis of the problem was the following:

Rear seat carpeting was smoldering. The rear seat passenger lit a cigarette shortly after takeoff. When he disposed of it in the ashtray, it was not completely extinguished. The cigarette fell down from the ashtray and was beginning to char upholstery material. The fire was easily extinguished, once recognized and posed no immediate danger to the flight.

Appendix C

Sample of Subject Data

S T A T I S T I C A L   A N A L Y S I S   S Y S T E M

*THE FOLLOWING SECTION IS A BRIEF DESCRIPTION OF THE VARIABLES

BIOGRAPHICAL SURVEY

```
STUDENT    : STUDENT IDENTIFICATION NUMBER
CERT       : PILOT CERTIFICATION
              1=STUDENT         PILOT
              2=PRIVATE         PILOT
              3=COMMERCIAL      PILOT
              4=AIR TRANSPORT PILOT
RAT        : AIRMAN RATINGS
              1=REPAIRMAN
              2=AIRCRAFT MECHANIC
              3=POWPLT.  MECHANIC
              4=FLIGHT ENGINEER
              5=INSTRUMENT RATING
              6=CERTIFIED FLIGHT INSTRUCTOR
              7=ASEI
              8=AMEI
              9=ROTARY WING
             10=INSPECTOR AUTHORIZATION
             11=NONE OF THE ABOVE
TT         : TOTAL FLYING EXPERIENCE IN HRS.
              1=< 100
              2=100-300
              3=301-500
              4=501-1000
              5=1001-2000
              6=2001-3000
              7=3001-4000
              8=4001-5000
              9=5001-10000
             10=10001-20000
             11=<20000
SET        : SINGLE ENGINE FLYING EXPERIENCE
              1=< 100
              2=100-300
              3=301-500
              4=501-1000
              5=1001-2000
              6=2001-3000
              7=3001-4000
              8=4001-5000
              9=5001-10000
             10=10001-20000
             11=<20000
IT         : INSTRUMENT    FLYING EXPERIENCE
              1=< 100
              2=100-300
              3=301-500
              4=501-1000
              5=1001-2000
              6=2001-3000
              7=3001-4000
              8=4001-5000
              9=5001-10000
```

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```
             10=10001-20000
             11=<20000
BI         : BIANNUAL FLIGHT TEST
              1= LAST 30  DAYS
              2= LAST 90  DAYS
              3= LAST 180 DAYS
              4= LAST 360 DAYS
              5= LAST 2   YRS.
              6= OVER 2   YRS.
PIC        :  PILOT IN COMMAND HRS.
              1= LAST 30  DAYS
              2= LAST 90  DAYS
              3= LAST 180 DAYS
              4= LAST 360 DAYS
              5= LAST 2   YRS.
              6= OVER 2   YRS.
IFR        :  INSTRUMENT FLIGHT RULES, PLAN SUBMITTED
              1= LAST 30  DAYS
              2= LAST 90  DAYS
              3= LAST 180 DAYS
              4= LAST 360 DAYS
              5= LAST 2   YRS.
              6= OVER 2   YRS.
INST       :  LAST FLEW ON IFR
              1= LAST 30  DAYS
              2= LAST 90  DAYS
              3= LAST 180 DAYS
              4= LAST 360 DAYS
              5= LAST 2   YRS.
              6= OVER 2   YRS.
SO         :  SOURCE OF INSTRUMENT FLIGHT TRAINING
               1=MILITARY
               2=CIVIL-FORMAL
               3=CIVIL-FREELANCE
CUR        : CURRENT FLYING ACTIVITIES  INCICATOR VARIABLES  1=YES 0=NO
              1=AIRLINE  FLIGHT CREW
              2=MILITARY FLIGHT CREW
              3=GA(HIRED PILOT)
              4=GA(PERSONAL BUSINESS)
              5=GA(PERSONAL PLEASURE)
PRI        : PRIMARY FLYING ACTIVITIES  INDICATOR VARIABLES  1=YES 0=NO
              1=AIRLINE  FLIGHT CREW
              2=MILITARY FLIGHT CREW
              3=GA(HIRED PILOT)
              4=GA(PERSONAL BUSINESS)
              5=GA(PERSONAL PLEASURE)
AGE        : 1=UNDER 20
             2=20-30
             3=31-40
             4=41-50
             5=51-60
             6=61-70
             7=OVER 70
HIST       : WHEN PILOT WAS 1ST. RATED OR WHEN CERTIFICATION WAS RECEIVED
             1=BEFORE 1940
             2=1940-45
```

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```
                3=1946-50
                4=1951-55
                5=1956-60
                6=1961-65
                7=1966-70
                8=1971-75
                9=1976-1980
               10=AFTER 1980
```

KNOWLEDGE SURVEY

```
SCORE      : PERCENTAGE SCORE ON KNOWLEDGE SURVEY
CATSCR     : CATEGORY  SCORE ON KNOWLEDGE SURVEY
             1=KNOWLEDGE SUBSCORE FOR ENGINE AND FUEL SYSTEMS
             2=KNOWLEDGE SUBSCORE FOR ELECTRICAL SYSTEMS AND COCKPIT INST.
             3=KNOWLEDGE SUBSCORE FOR WEATHER AND IFR OPERATIONS
```

DESTINATION DIVERSION TEST

```
ORDER      : ORDER THAT SUBJECT REQUESTED INFORMATION IN
PORT       : AIRPORT DESIGNATION NUMBER
INFO       : TYPE OF INFORMATION REQUESTED
             1=BEARING AND DISTANCE
             2=CEILING
             3=VISIBILITY
             4=APPROACH AIDS
             5=ATC SERVICES AVAILABLE
             6=TERRAIN
CTIM       : CUMULATIVE TIME
OLDCTIM    : PREVIOUS CTIM
DELTA      : CTIM-OLDCTIM
SELEC      : AIRPORT SELECTED IN DEST. DIV. TEST
YN         : YES/NO VARIABLE
             1=YES MEANING PILOT WOULD     ATTEMPT THIS FLIGHT
             2=NO  MEANING PILOT WOULD NOT ATTEMPT THIS FLIGHT
MEANDT     : MEAN OF THE DELTA TIMES FOR INQUIRIES
VARDT      : VARIANCE OF THE DELTA TIMES FOR INQUIRIES
MEANPA     : MEAN OF THE TIMES TO PICK AN AIRPORT
VARPA      : VARIANCE OF THE TIMES TO PICK AN AIRPORT
TOTINQDD   : TOTAL NUMBER OF INQUIRIES IN DESTINATION DIVERSION
TOTAIRP    : TOTAL NUMBER OF AIRPORTS PICKED
UNIQAIRP   : NUMBER OF UNIQUE AIRPORTS LOOKED AT
MINQAIR    : MEAN NUMBER OF INQUIRIES PER AIRPORT
VINQAIR    : VARIANCE OF THE NUMBER OF INQUIRIES PER AIRPORT
```

SCENARIOS

```
INQUIRIES  : NUMBER OF INQUIRIES  IN SCENARIO #N
DISPLAY    : TYPE OF DISPLAY CHOSEN BY SUBJECT
             1=INSTRUMENT PANEL
             2=INSIDE CABIN CONDITIONS
             3=ATC
             4=EXTERNAL CONDITIONS
ITEM       : ITEM CHOSEN FROM THE ABOVE DISPLAYS
             INSTRUMENT PANEL
```

S T A T I S T I C A L   A N A L Y S I S   S Y S T E M

```
CTIM          : CUMULATIVE TIME
OLDCTIM       : PREVIOUS CTIM
DELTA         : CTIM-OLDCTIM
 FTLB1-FTLB4: FLYING TIME LEFT BEFORE DIAGNOSIS GIVEN IN SCEN 1-4
               1= 0-5 MINUTES
               2= 5-30 MINUTES
               3= AS LONG AS FUEL PERMITS
 CRITB 1-4  : CRITICALITY OF PROBLEM BEFORE DIAGNOSIS GIVEN IN
              SCENARIOS 1-4      VALUED:FROM 1-7
 CRITA 1-4  : CRIICALITY OF PROBLEM AFTER DIAGNOSIS GIVEN IN
              SCENARIOS 1-4      VALUED:FROM 1-7
 CONF 1-4   : CONFIDENCE OF OWN DIAGNOSIS BEFORE DIAGNOSIS GIVEN IN
              SCENARIOS 1-4      VALUED:FROM 1-10
 FTLA 1-4   : FLYING TIME LEFT AFTER DIAGNOSIS GIVEN IN SCENARIOS 1-4
              1= 0-5 MINUTES
              2= 5-30 MINUTES
              3= AS LONG AS FUEL PERMITS
 C1-C5      : CORRECTNESS SCORES ON SCENARIOS 1-5
 TOTCOR     : C1+C2+C3+C4
 MEAN 1-5   : MEAN OF THE DELTA TIMES FROM SCENARIOS 1-5
 VAR 1-5    : VARIANCE OF THE DELTA TIMES FROM SCENARIOS 1-5
 TOTRAK     : TOTAL NUMBER OF TRACKS
 UNIQTRAK   : TOTAL NUMBER OF UNIQUE TRACKS
 TOCT       : TOTAL NUMBER OF TIMES ON THE CORRECT TRACK
 CORINQ     : TOTAL NUMBER OF INQUIRIES ON THE CORRECT TRACK
TOTINQ      : TOTAL NUMBER OF INQUIRIES FOR ALL FOUR SCENARIOS
SETA        :MIDPOINTS OF THE RANGES FOR SINGLE ENGINE HOURS
TTA         :MIDPOINTS OF THE RANGES FOR TOTAL FLYING EXPERIENCE
ITA         :MIDPOINTS OF THE RANGES FOR INSTRUMENT FLYING EXPERIENCE
SETLOG      :NATURAL LOGORITHM OF SINGLE ENGINE FLYING HOURS
TTLOG       :NATURAL LOGORITHM OF TOTAL FLYING HOURS
INPTRT      :RATIO OF TOTAL INQUIRIES TO TOTAL TRACKS FOR ALL FOUR SCENARIOS
ZT          :RATIO OF TOTAL CORRECT TO TOTAL NUMBER OF TRACKS FOR ALL FOUR SCENS.
DIFTT       :DIFFERENCE BETWEEN NUMBER OF TOTAL TRACKS AND NUMBER OF UNIQUE TRACK
MDELTAT     :THE MEAN DELTA TIME ON ALL 4 SCENARIOS FOR EACH SUBJECT
SCEN        :NUMBER OF SCENARIOS COMPLETED BY EACH SUBJECT
KEY         :YES/NO RESPONSE CORRESPONDING TO WHETHER THE SUBJECT HIT
             UPON THE CORRECT ITEM DURING DIAGNOSTIC SEARCH;
```

DATA DISPLAY

This program reports the data collected by the CRITICAL IN-FLIGHT EVENT program.

Each display is a record of responses given by a student for each phase of the CRITICAL IN-FLIGHT EVENT program.

Function keys provided:

CONTINUE will advance to the next display

REVIEW will return to the previous display

MENU will access the main menu display

RESTART will start the program again

Please enter the student that you wish to view.
(For example: studentØ41)

> studentØ75

Press NEXT when entered.

DATA DISPLAY

NAME: studentØ75
DATE: Ø6/Ø9/82

Biographical Survey

Diagnostic Scenario #Ø1

Destination Diversion Test

Knowledge Survey

Diagnostic Scenario #Ø2

Airport Ranking Test

Diagnostic Scenario #Ø3

Previous CIFE Question

Diagnostic Scenario #Ø4

Diagnostic Scenario #Ø5

Diagnostic Scenario #Ø6

RESTART

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**cifel

Biographical Survey

DATE: Ø6/Ø9/82

QUESTION	ANSR
1	c (3)
2	e (5)
2	h (8)
2	g (7)
3	f (6)
4	b (2)
5	d (4)
6	f (6)
7	f (6)
8	f (6)
9	f (6)
1Ø	a (1)
11	b (2)
12	b (2)
13	b (2)
14	c (3)

QUESTION	ANSR
15	g (7)

CONTINUE

MENU

REVIEW

DATA DISPLAY
**cife2

Knowledge Survey

DATE: Ø6/Ø9/82

QUESTION (x=incorrect)		ANSR	AREA
x	1	c	3
	2	c	2
x	3	b	2
	4	b	2
x	5	b	1
x	6	c	2
x	7	a	1
	8	a	3
	9	b	2
	1Ø	a	2

QUESTION (x=incorrect)		ANSR	AREA
x	11	b	1
	12	b	3
x	13	a	1
x	14	e	3
x	15	a	2
x	16	b	3
x	17	b	1
x	18	c	3
x	19	d	1
x	2Ø	d	1

SCORE = 3Ø%

AREA	TOTAL MISSED	TOTAL IN AREA
1) Engine and fuel systems	7	7
2) Electrical systems and cockpit instrumentation	3	7
3) Weather and IFR operations	4	6

CONTINUE MENU REVIEW

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DATA DISPLAY
**cife3
**scene01

Diagnostic Scenario #01

NAME: student075
DATE: 06/09/82

TIME (sec)	ΔTIME (sec)	DISPLAY	ITEM	CURRENT VALUE
7	7	instr pan	oil temp	
14	4	instr pan	cyl head temp	
18	19	instr pan	oil pres	
37	12	instr pan	EGT	
49	8	instr pan	prop RPM	
57	8	instr pan	prop RPM dec.	
65	5	instr pan	throttle	
70	26	instr pan	throttle decrease	
96	5	Ext info	cowling	
101	29	Ext info	windscreen	
130		GIVE ANSR		

CONTINUE

MENU

REVIEW

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DATA DISPLAY
**cife3
**scene01

Diagnostic Scenario #01

NAME: student075
DATE: 06/09/82

1) LEXICON RESPONSE: oil
line
leaking

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2) FLYING TIME LEFT: 0-5 minutes

3) HOW CRITICAL PROB (1-7): 5

4) HOW CONFIDENT OF OWN DIAG (1-10): 8

5) FLYING TIME LEFT (with our diag): as long as fuel permits

6) HOW CRITICAL PROB (with our diag): 1

CONTINUE | MENU | REVIEW

**cife3
**scene02

Diagnostic Scenario #02

DATE: 06/09/82

TIME (sec)	ΔTIME (sec)	DISPLAY	ITEM	CURRENT VALUE
6	4	Ext info	aileron	
10	5	Ext info	flap	
15	2	Ext info	cowling	
17	3	Ext info	windscreen	
20	2	Ext info	wing	
22	22	Ext info	stabilizer	
44	18	Int info	panel temp	
62	19	instr pan	OAT	
81	8	instr pan	breaker panel	
89	7	instr pan	alt static	
96	5	instr pan	alt static open	
101	7	instr pan	alt static closed	
108	9	instr pan	pitot heat	
117	6	instr pan	pitot heat on	
123	27	instr pan	pitot heat off	
150	7	ATC info	freezing level	
157	5	ATC info	cloud tops	
162	12	ATC info	ceiling	
174	6	ATC info	visibility	
180	3	ATC info	PIREPS	
183	2	ATC info	SIGMETS	
185	45	ATC info	AIRMETS	

CONTINUE MENU REVIEW

**cife3 **scene02	Diagnostic Scenario #02	DATE: 06/09/82

1) LEXICON RESPONSE: static
ice

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2) FLYING TIME LEFT: as long as fuel permits

3) HOW CRITICAL PROB(1-7): 5

4) HOW CONFIDENT OF OWN DIAG(1-10): 5

5) FLYING TIME LEFT(with our diag): 5-30 minutes

6) HOW CRITICAL PROB(with our diag): 5

CONTINUE	MENU	REVIEW

DATA DISPLAY
**cife3
**scene03

Diagnostic Scenario #03

NAME:	student075
DATE:	06/09/82

TIME (sec)	ΔTIME (sec)	DISPLAY	ITEM	CURRENT VALUE
7	2	Ext info	windscreen	
9	4	Ext info	cowling	
13	21	Ext info	wing	
34	14	instr pan	TACH	
48	4	instr pan	MAG	
52	4	instr pan	MAG left	
56	6	instr pan	MAG right	
62	4	instr pan	MAG off	
66	10	instr pan	MAG left	
76	18	instr pan	MAG right	
94	1	instr pan	amps	
95	3	instr pan	oil temp	
98	2	instr pan	cyl head temp	
100	9	instr pan	oil pres	
109	8	instr pan	mix	
117		GIVE ANSR		

CONTINUE | MENU | REVIEW

DATA DISPLAY
**cife3
**scene03

Diagnostic Scenario #03

NAME:	student075
DATE:	06/09/82

1) LEXICON RESPONSE: right
magneto
failure

2) FLYING TIME LEFT: as long as fuel permits

3) HOW CRITICAL PROB(1-7): 3

4) HOW CONFIDENT OF OWN DIAG(1-10): 9

5) FLYING TIME LEFT(with our diag): as long as fuel permits

6) HOW CRITICAL PROB(with our diag): 2

CONTINUE MENU REVIEW

ORIGINAL PAGE IS OF POOR QUALITY

DATA DISPLAY
**cife3
**scene04

Diagnostic Scenario #04

NAME:	student075
DATE:	06/09/82

TIME (sec)	ΔTIME (sec)	DISPLAY	ITEM	CURRENT VALUE
10	12	Ext info	wing	
22	3	Ext info	windscreen	
25	3	Ext info	cowling	
28	2	Ext info	flap	
30	7	Ext info	aileron	
37	9	ATC info	freezing level	
46	4	ATC info	ceiling	
50	3	ATC info	cloud tops	
53	2	ATC info	PIREPS	
55	1	ATC info	SIGMETS	
56	13	ATC info	AIRMETS	
69	3	instr pan	pitot heat	
72	15	instr pan	pitot heat on	
87	3	instr pan	alt static	
90	19	instr pan	alt static open	
109	10	instr pan	OAT	
119		GIVE ANSR		

CONTINUE | MENU | REVIEW

ORIGINAL PAGE IS
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DATA DISPLAY
**cife3
**scene04

Diagnostic Scenario #04

NAME: student075
DATE: 06/09/82

1) LEXICON RESPONSE: static
ice

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2) FLYING TIME LEFT: as long as fuel permits

3) HOW CRITICAL PROB(1-7): 1

4) HOW CONFIDENT OF OWN DIAG(1-10): 8

5) FLYING TIME LEFT(with our diag): as long as fuel permits

6) HOW CRITICAL PROB(with our diag): 1

CONTINUE MENU REVIEW

DATA DISPLAY
**cife4

Destination Diversion Test

DATE: Ø6/Ø9/82

Based on the information you have received so far, would you normally attempt this flight?

YES

ORIGINAL PAGE IS
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CONTINUE

MENU

REVIEW

DATA DISPLAY
**cife4

Destination Diversion Test

DATE: Ø6/Ø9/82

TIME (sec)	ΔTIME (sec)	AIRPORT	INFO QUERIED
12	12	5	
2Ø	8	5	approach aids (4)
26	6	5	ATC services (5)
41	15	1	
44	3	1	approach aids (4)
46	2	1	ATC services (5)
5Ø	4	1	ceiling (2)
53	3	1	visibility (3)

TIME (sec)	ΔTIME (sec)	AIRPORT	INFO QUERIED

CONTINUE

MENU

REVIEW

''**cife4

Destination Diversion Test

DATE: Ø6/Ø9/82

" studentØ75" has chosen airport" #1 "

CONTINUE

MENU

REVIEW

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DATA DISPLAY
cife
question

Previous CIFE Question

DATE: Ø6/Ø9/82

Have you ever had a CIFE in any of the areas?

Electrical

Ice

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CONTINUE

MENU

REVIEW

DATA DISPLAY

NAME: studentØ75
DATE: Ø6/Ø9/82

Do you wish to:

See another student's record

Return to the MENU

See the last display

STOP the program

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Appendix D

Destination Diversion Displays

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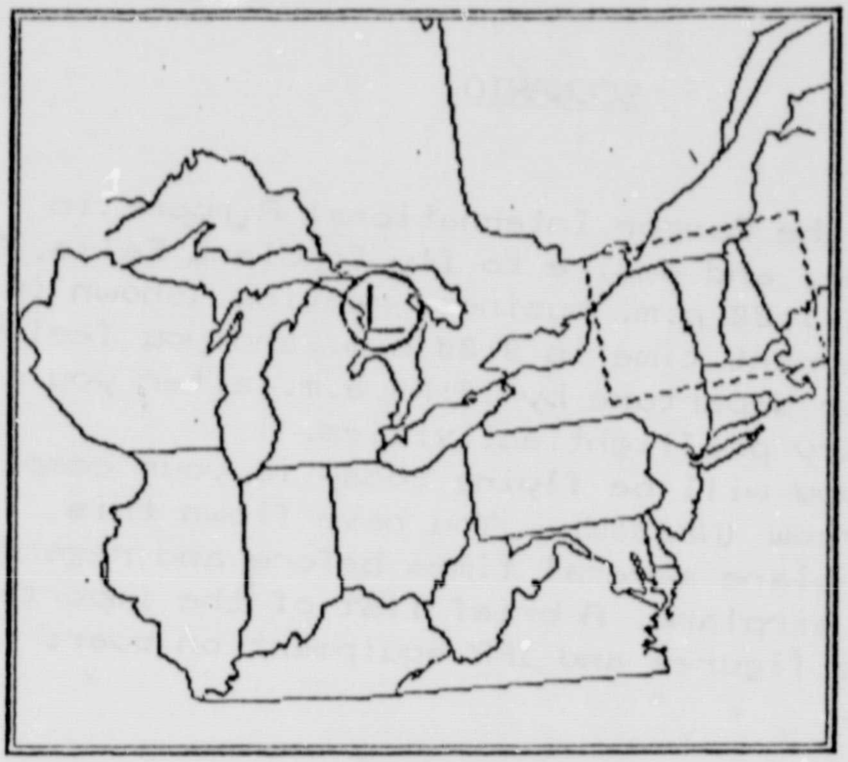

Exhibit 1

IFR conditions prevail over most of our area of concern, except over northeastern New York, where conditions are slightly better. More detailed weather information will be provided when appropriate.

CONTINUE

REVIEW

SCENARIO

You are at the Bangor International Airport in Bangor, Maine, and desire to fly to Glens Falls, New York, for a 1:00 p.m. business meeting (shown in Fig. I). The current time is 9:00 a.m. and you feel you can be ready for departure by 10:00 a.m. after you conduct all necessary preflight activities.
The plane you will be flying today is your company's Cherokee Arrow (N8086W). You have flown this particular plane several times before and regard it as a reliable airplane. A brief list of the important performance figures and IFR equipment on board is shown in Table I.

CONTINUE

REVIEW

TABLE I

Important Specs. and Performance Figures

Cruise Speed = 135 KTAS (65% pwr. @ 7000 ft.)

Fuel Flow (65% pwr.) = 10 GPH

Usable Fuel Capacity = 48 gallons

Endurance = 4.8 hours (no reserve)

Range = 648 nautical miles (no wind, no reserve)

IFR Equipment on Board

2 NAV/COMMs

2 VOR/ILS indicators

1 ADF

1 Three-light marker beacon receiver

1 Transponder (not encoding)

1 Single axis autopilot

CONTINUE

REVIEW

The aircraft's fuel tanks are full, and after a very thorough preflight inspection, you conclude that it is operationally and legally ready for the flight.

Now your attention turns to the weather and filing a flight plan. You call the nearest Flight Service Station on the telephone and obtain the weather information in Table II.

CONTINUE

REVIEW

TABLE II

for Glenn Falls (New York): The weather is currently "1000 feet overcast and 3 miles visibility in rain." It is forecast to stay that way until 1:00 p.m., local time, when it should improve to 1500 overcast and 5 miles visibility.

for Bangor (Maine): The weather is currently "1000 feet overcast and 3 miles visibility in rain and fog." It is forecast to remain unchanged except for a chance of 500 feet overcast and 1 mile visibility in rain, drizzle, and fog.

for Albany (New York): The weather is currently "1000 feet overcast and 4 miles visibility in light rain." It is forecast to remain the same until 1:00 p.m., at which time it should improve to "1500 feet overcast and 4 miles.

Winds aloft: from the southwest (200°) at 30 knots at all altitudes up to 9000 feet.

Icing Level: 10,000 feet

No PIREPs reported

CONTINUE

REVIEW

TABLE III

<table>
<tr><td colspan="7">FLIGHT PLAN</td></tr>
<tr><td>1. TYPE
VFR
X IFR
DVFR</td><td>2. AIRCRAFT ID.
N8Ø86W</td><td>3. AIRCRAFT TYPE/ SPECIAL EQUIP.
PA 28R-200/T</td><td>4. TRUE AIRSPEED
135 KTS.</td><td>5. DEPARTURE PT.
BGR</td><td>6. DEPARTURE TIME
Prop.
1Ø:ØØ</td><td>Act.</td></tr>
<tr><td colspan="7">8. ROUTE OF FLIGHT
V3 to Augusta VOR V39 to Neets intersection V496 to Glenn Falls</td></tr>
<tr><td>9. DESTINATION
GFA
(Glenn Falls)</td><td>1Ø. EST. TIME ENROUTE
HOURS
2</td><td>MINUTES
15</td><td colspan="4">11. REMARKS</td></tr>
<tr><td>12. FUEL ON BOARD
HOURS
4</td><td>MINUTES
5Ø</td><td>13. ALTERNATE AIRPORT(S)
Albany</td><td colspan="2">14. PILOT'S NAME</td><td colspan="2">15. NUMBER ABOARD
1</td></tr>
<tr><td colspan="2">16. COLOR OF AIRCRAFT
Red on White</td><td colspan="5">CLOSE VFR FLIGHT WITH_______ FSS ON ARRIVAL</td></tr>
</table>

CONTINUE

REVIEW

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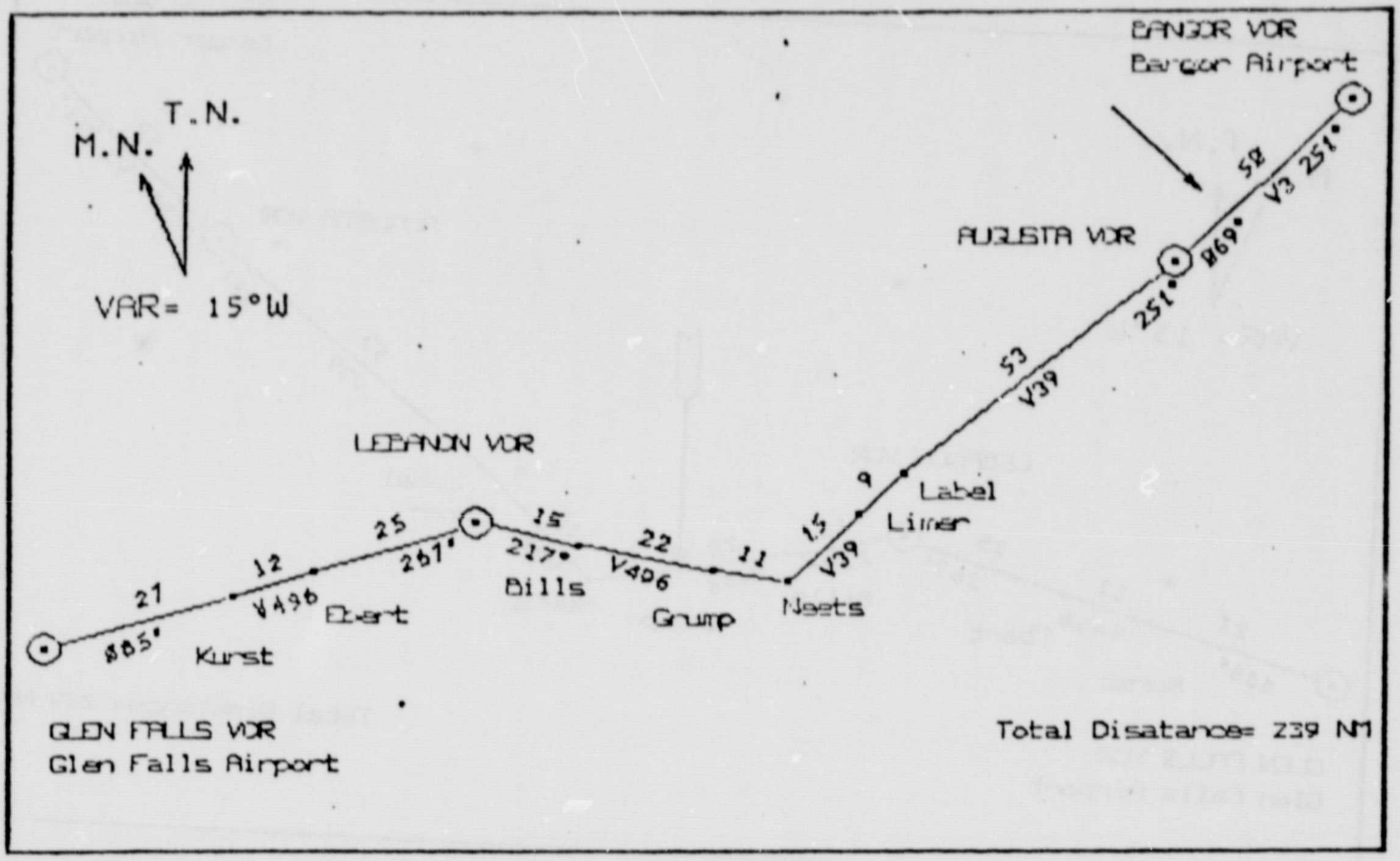

DESCRIPTION OF THE FLIGHT:

You were cleared to the Glen Falls airport "as filed". You lifted off from Bangor at 10:00 a.m., and your departure was routine. At 10:14 (14 minutes after departure) you reached your cruising level of 8000 feet and were established on V3 northeast of the Augusta VOR.

CONTINUE

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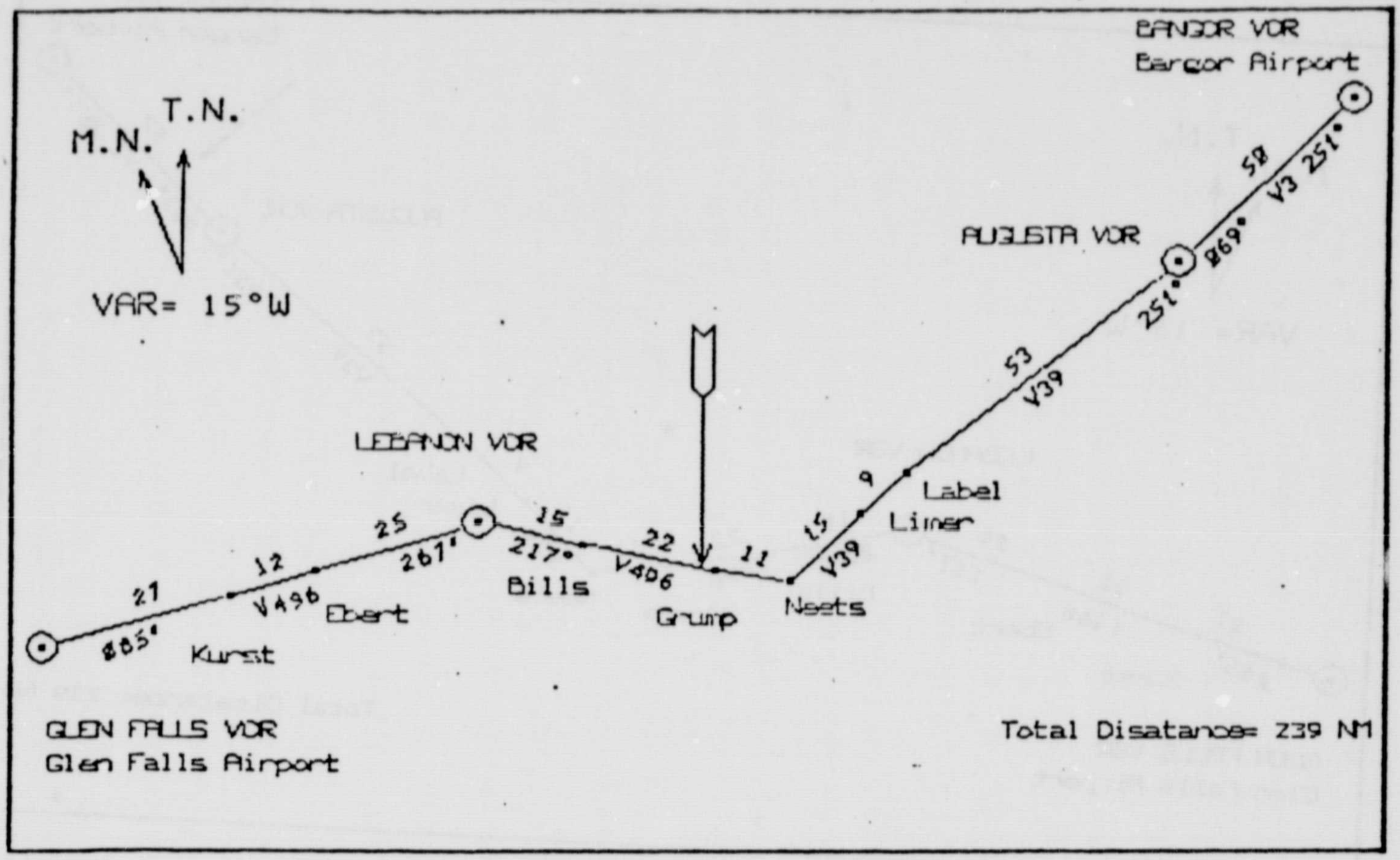
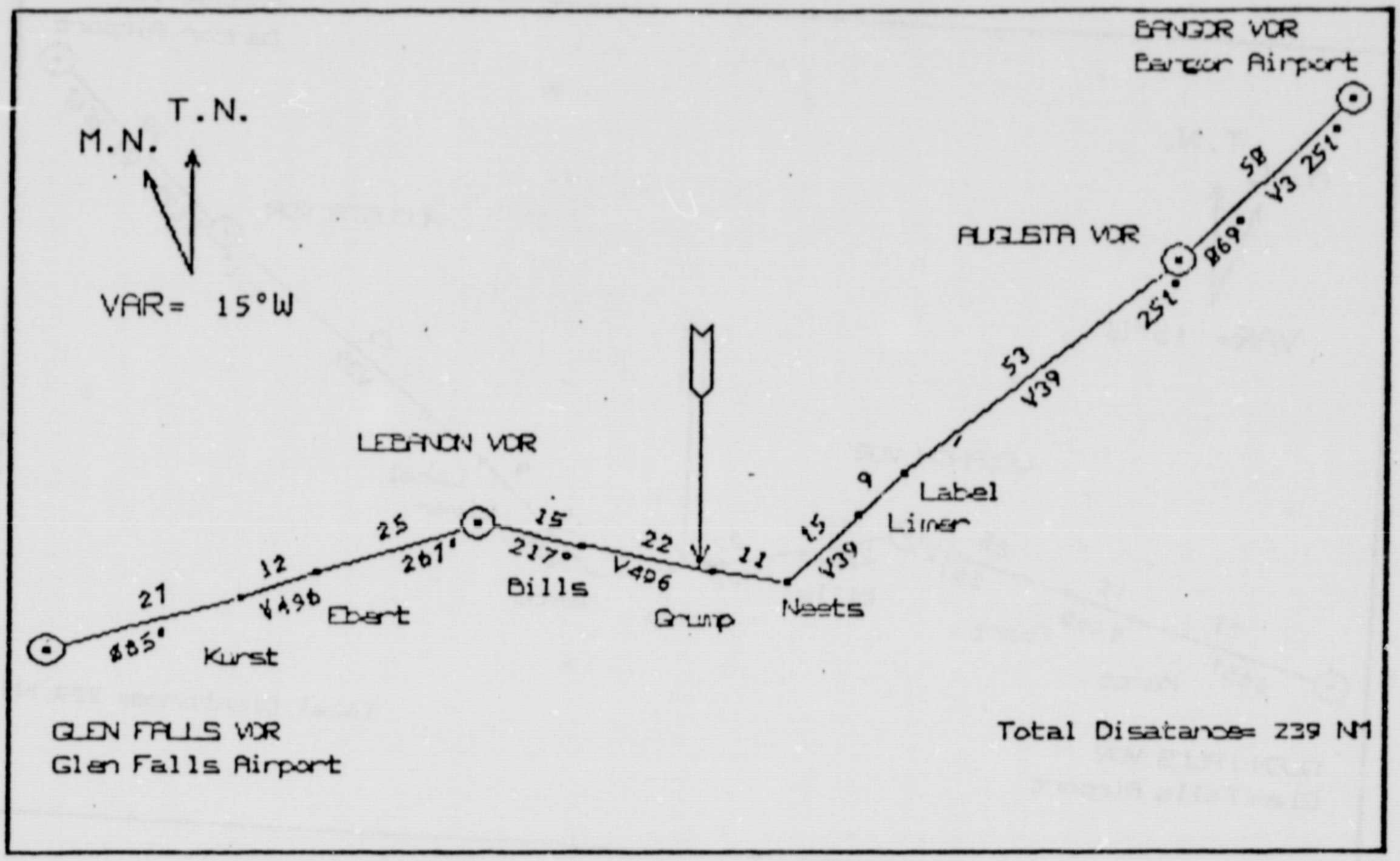


At 11:21 (1 hour 21 minutes after departure) you cross Grump intersection. One minute later you hear a short static noise over your radio speakers. At the same time you notice you VOR needles and their "on-off" flags flicker unsteadily and return to normal indications.

CONTINUE

REVIEW



Curious to know what caused these events, you glance over the instrument panel and find a "zero" reading on the ammeter. You actuate the landing light and notice no change in ammeter indications. From this information you conclude the alternator has failed.

CONTINUE   REVIEW

ORIGINAL PAGE IS
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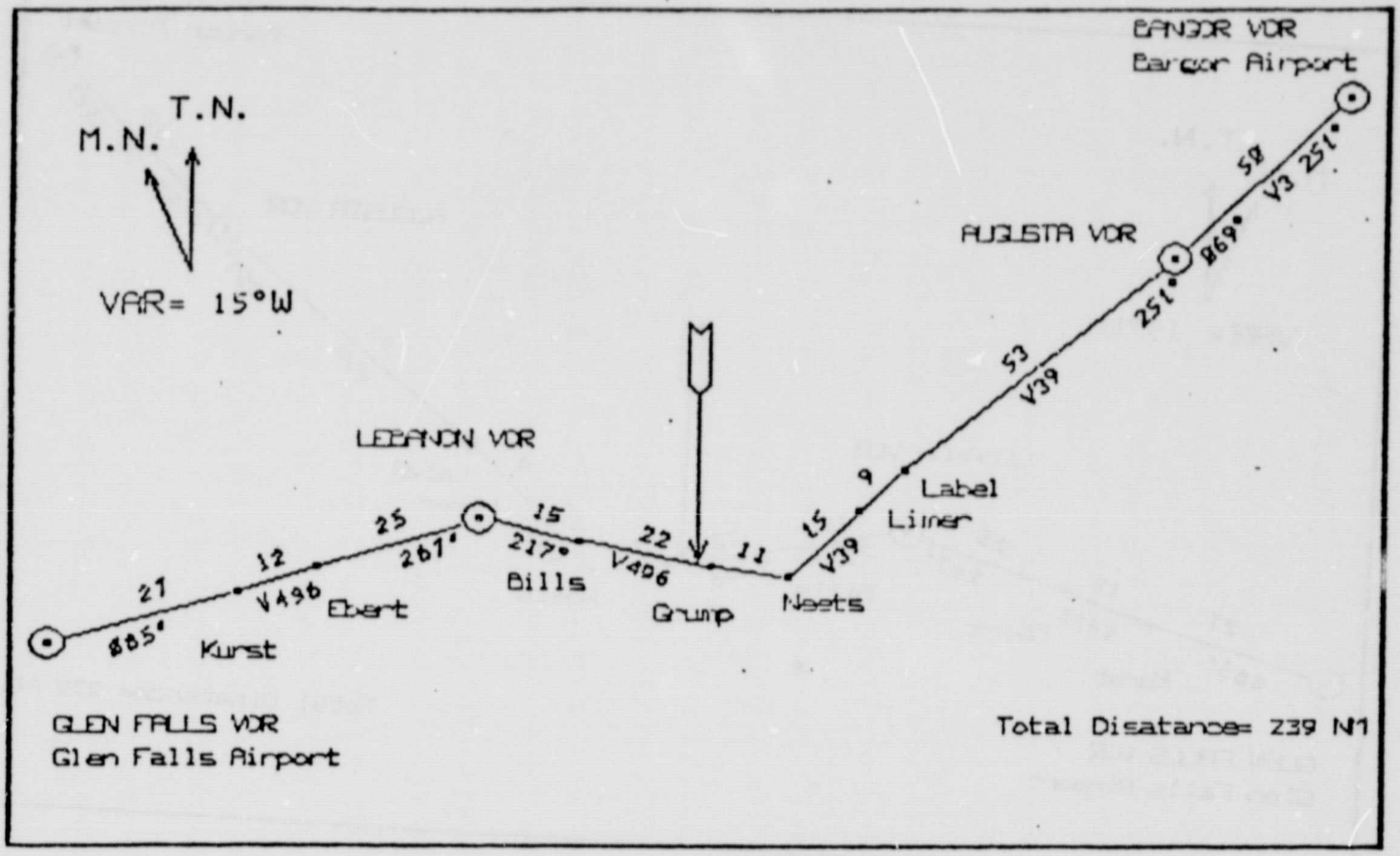

You follow the procedures in the manual but your attempts to bring the alternator back into service are unsuccessful. Therefore, you turn off the alternator, minimize the electrical load, and operate solely on battery power.

CONTINUE

REVIEW

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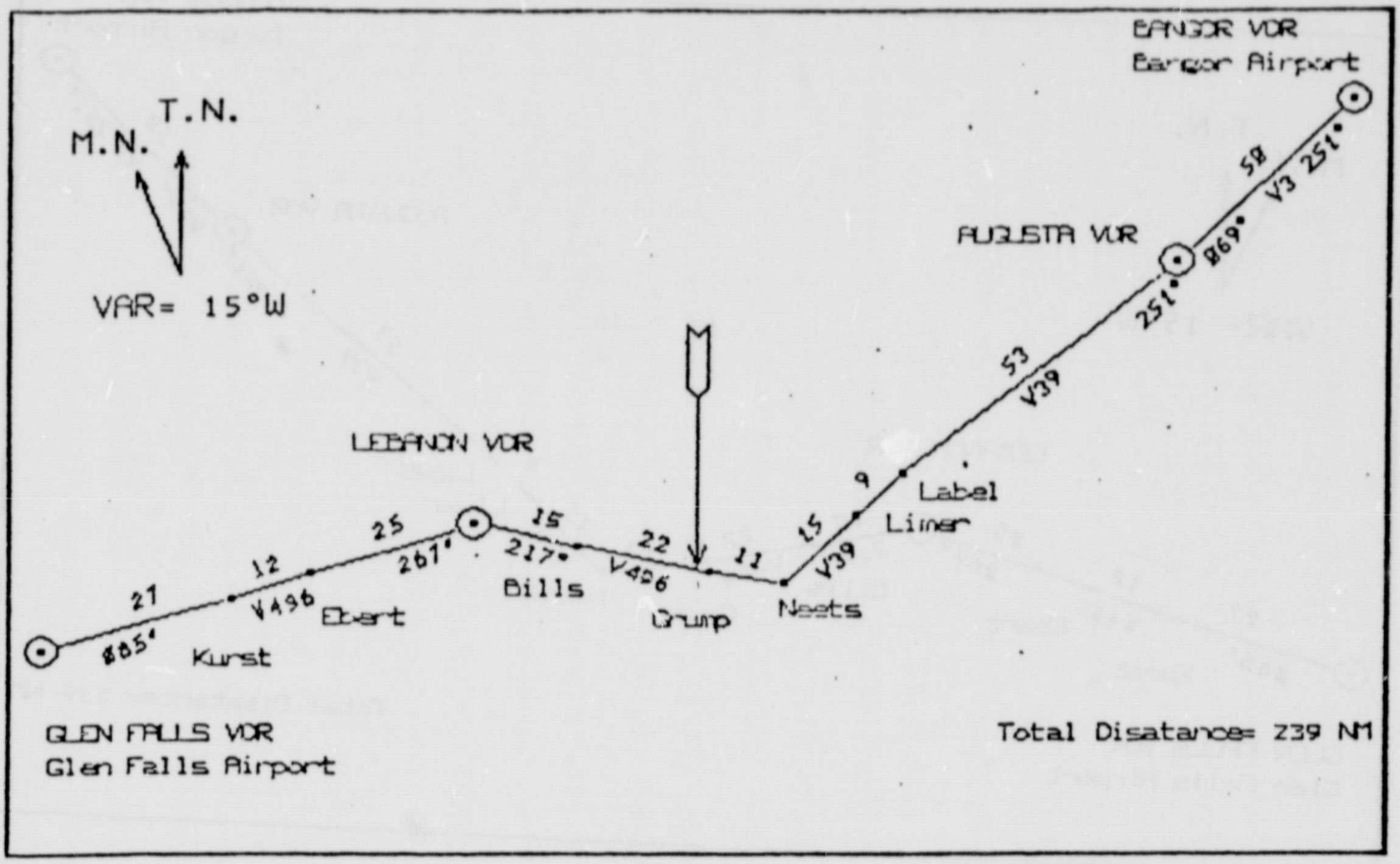
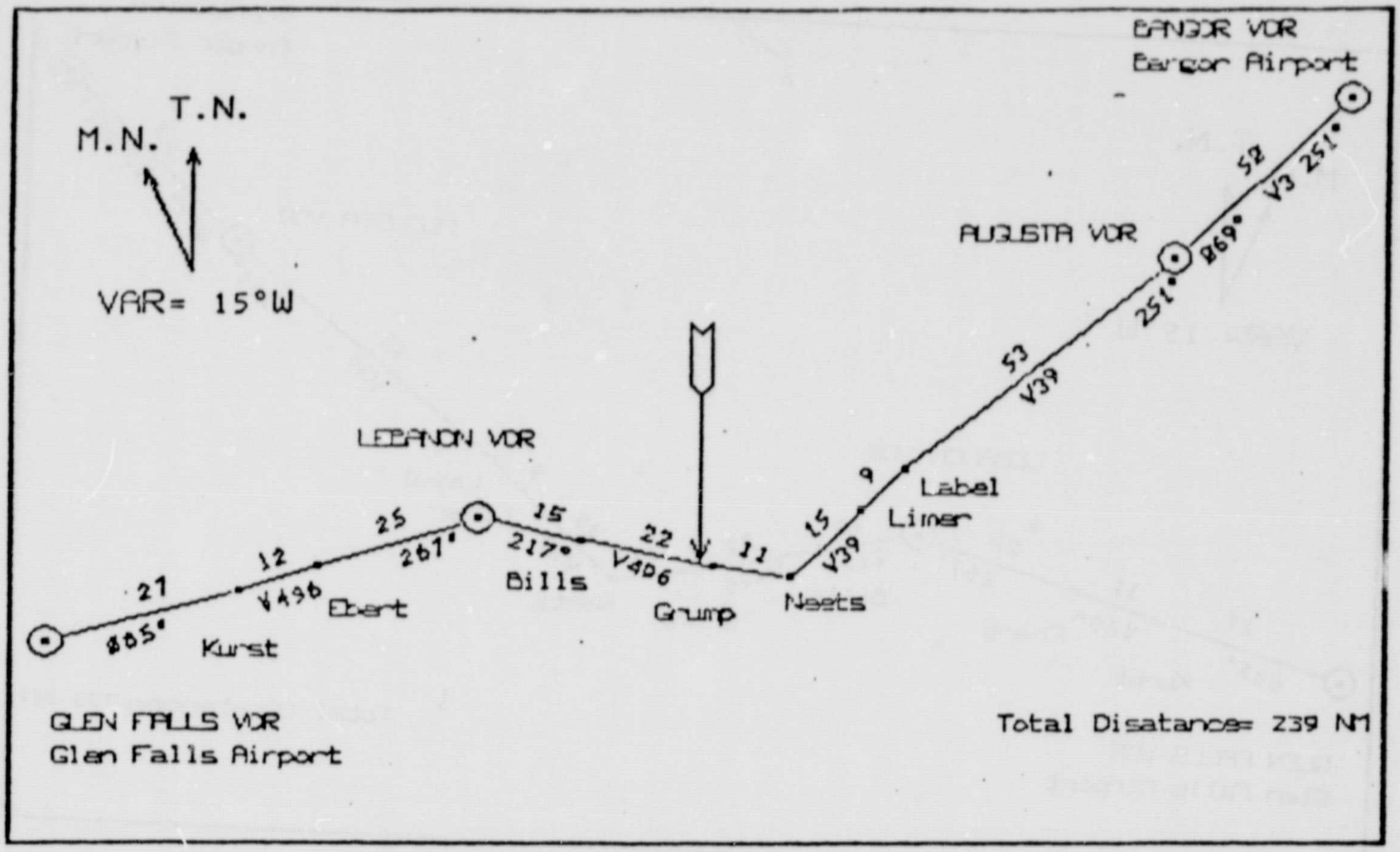


The battery, by itself, can supply the required power to operate your radios for only a limited time. The amount of time you have depends on the size and condition of the battery, and the power requirements of the essential electrical equipment you use. Even under ideal conditions battery power is not expected to last longer than <u>5Ø minutes</u>.

CONTINUE

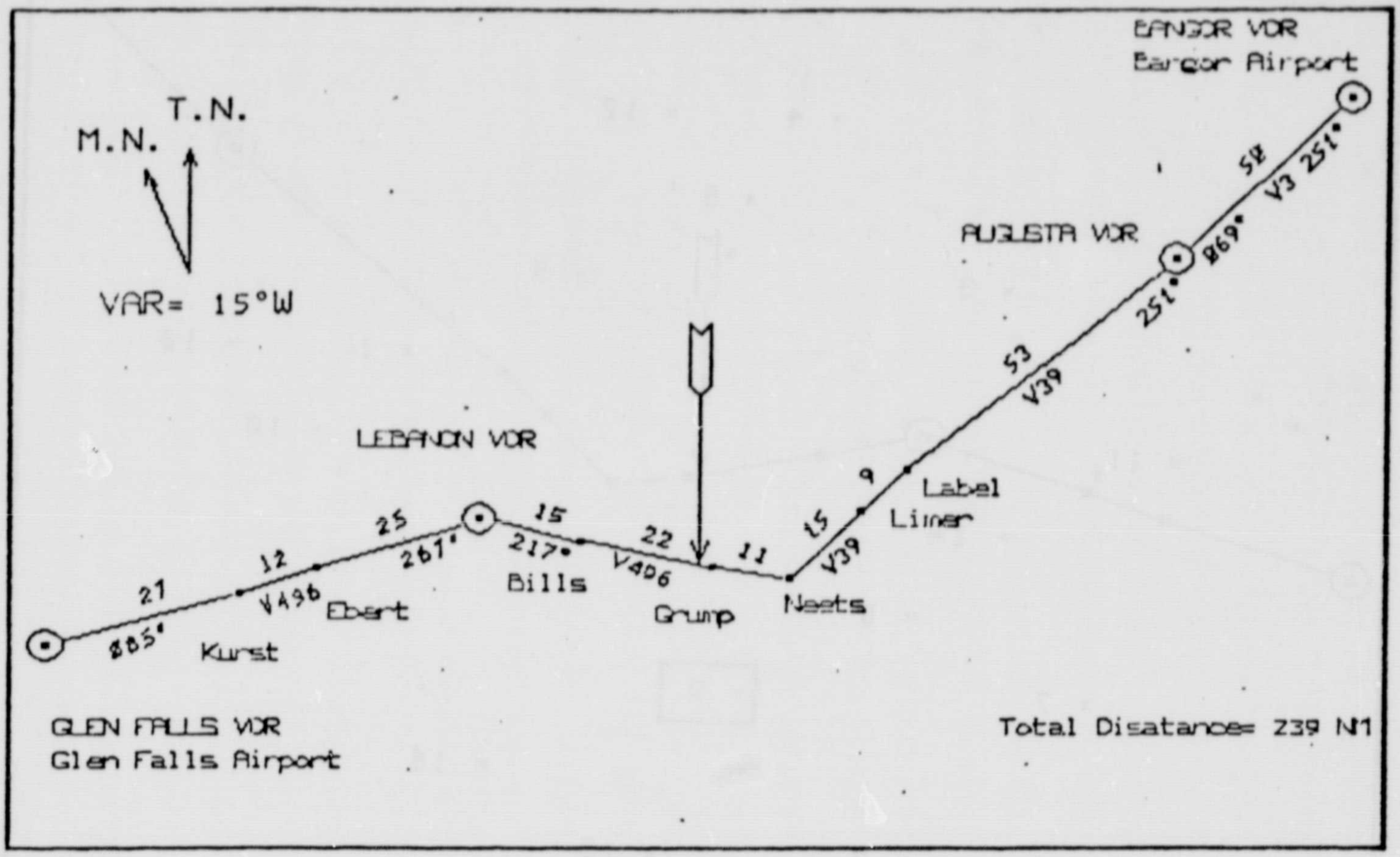
REVIEW



You are at an altitude of 8000 feet, just west of Grump intersection. The time is now 11:23 and you have been airbourne for 1 hour and 23 minutes. Winds are out of the southwest at 30 knots.

CONTINUE

REVIEW



The following information is available from air traffic control <u>one piece at a time</u>:

1) Bearing & Distance
2) Ceiling
3) Visibility
4) Approach Aids
5) ATC Services
6) Terrain

CONTINUE

REVIEW

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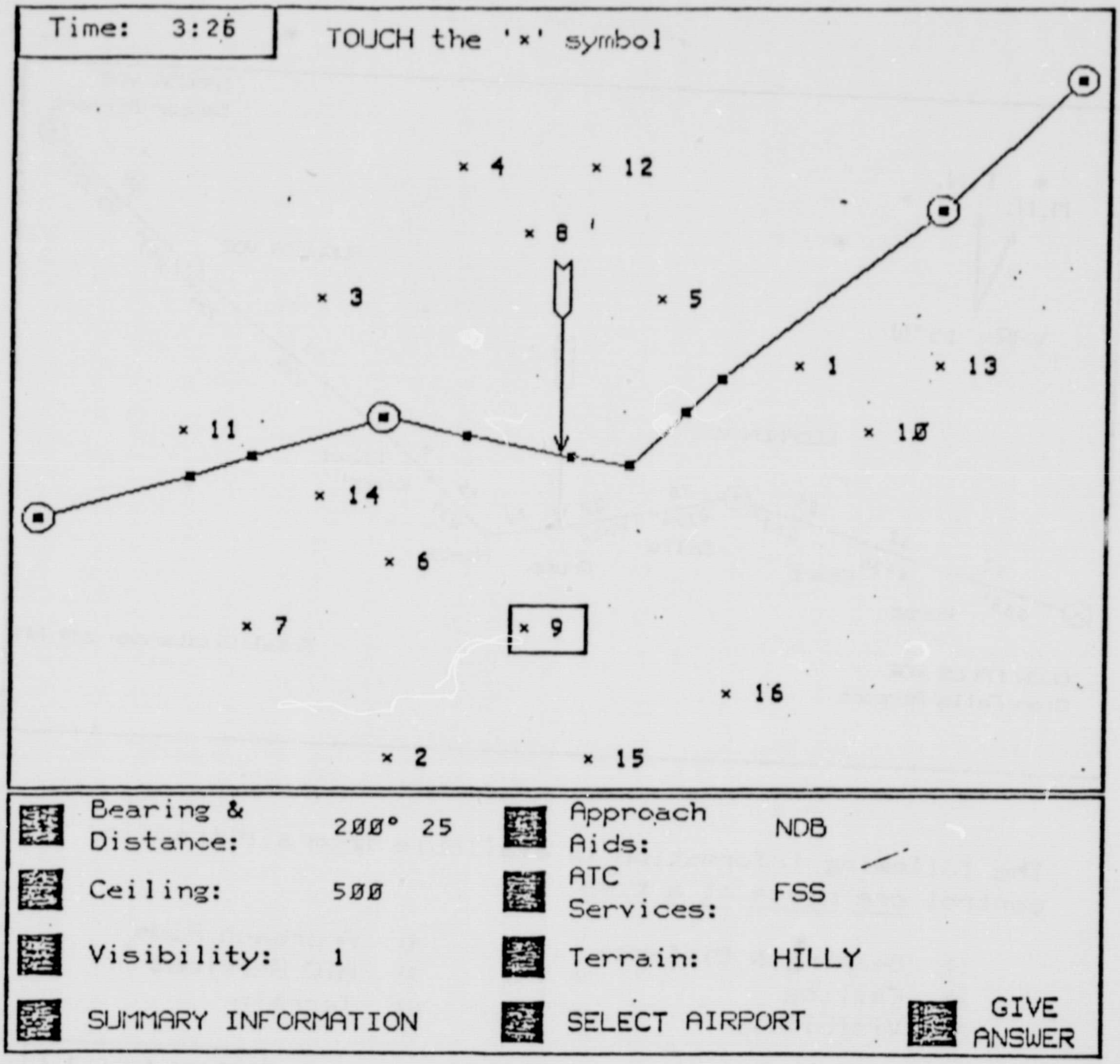

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Time: 0:12 You have requested the following information:

Air-port	Bearing; Distance	Ceil	Visi	Approach Aids	ATC Services	Terrain
1						
2		700	1			
3	330° 60	1000	3	VOR	TWR (R)	HILLY
4						
5						
6						
7		500	2			
8						
9	200° 25	500	1	NDB	FSS	HILLY
10		500	1			
11						
12						
13	040° 70	1000	2	ILS	TWR (R)	LEVEL
14						
15						
16						

AIRPORT

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

SELECT an airport then touch ENTER.

You will be able to fly to that airport and shoot one approach only.

AIRPORT: "3"

ENTER

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RANKING EXERCISE INSTRUCTIONS

You have just finished choosing an airport to divert to in the face of a serious problem. Now we would like you to consider yourself to be in that same situation again. The next display will present a table of airports and descriptions in terms of ATC services, weather, the flight time from your present position to the airport, and the approach facilities there.

We would like you to rank these airports from your "most preferable" ("1") to "least preferable" ("16"), given the same situation. Recall that you have, at the very most, 5Ø minutes of battery time left.

You will use the touch screen to input your airport selection and assign it a rank. You will be able to edit your ranking at any time. When you have ranked all 16 airports ("x1 thru x16") you will be asked if you want to submit the list or continue editing it.

CONTINUE

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Port	ATC Services	Ceil	Visi	Time (min)	Approach Aids	Port	RANK
x1	TWR (R)	1000	3	15	ILS	x1	1
x2	TWR	1000	3	15	ILS	x2	2
x3	TWR (R)	500	1	15	ILS	x3	
x4	TWR	500	1	15	ILS	x4	
x5	TWR (R)	1000	3	30	ILS	x5	
x6	TWR	1000	3	30	ILS	x6	
x7	TWR (R)	500	1	30	ILS	x7	6
x8	TWR	500	1	30	ILS	x8	
x9	TWR	1000	3	15	NDB	x9	
x10	TWR	1000	3	15	NDB	x10	
x11	TWR (R)	500	1	15	NDB	x11	
x12	TWR	500	1	15	NDB	x12	
x13	TWR (R)	1000	3	30	NDB	x13	
x14	TWR	1000	3	30	NDB	x14	
x15	TWR (R)	500	1	30	NDB	x15	
x16	TWR	500	1	30	NDB	x16	

If you knew airport "x2" had maintenance facilities, would you "pass up" airport "x1" for airport "x2"?

YES

NO

Appendix E

Combined Destination Diversion Scenario

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TEST version

DIAGNOSTIC SCENARIO TEST

We are now going to present to you some Critical In-Flight Events requiring your diagnosis of the problem.

Assume that you are flying a fuel-injected Cherokee Arrow (N123B) with the following performance specifications:

Cruise Speed = 135 KTAS (65% pwr. @ 7000 ft.)

Fuel Flow (65% pwr.) = 10 GPH

Usable Fuel Capacity = 48 gallons

Endurance = 4.8 hours (no reserve)

Range = 648 nautical miles (no wind, no reserve)

Press CONTINUE when finished reading.

CONTINUE

Consult attached simplified low altitude chart.

You are on an IFR flight from Utah Municipal Airport to Haven County Airport. You depart on V-110 at 6000ft in your Cherokee Arrow (N123B) which is equipped with a 3-axis autopilot. There is a NOTAM out which reports that Colorado VOR is out of service during the period you plan to navigate. Navigate using Ohigh and California VORs. You have been enroute 60 minutes from Utah Municipal Airport. You are on the gauges but the ride is smooth. Weather briefing indicated that winds at 6000 were expected to be light and variable.

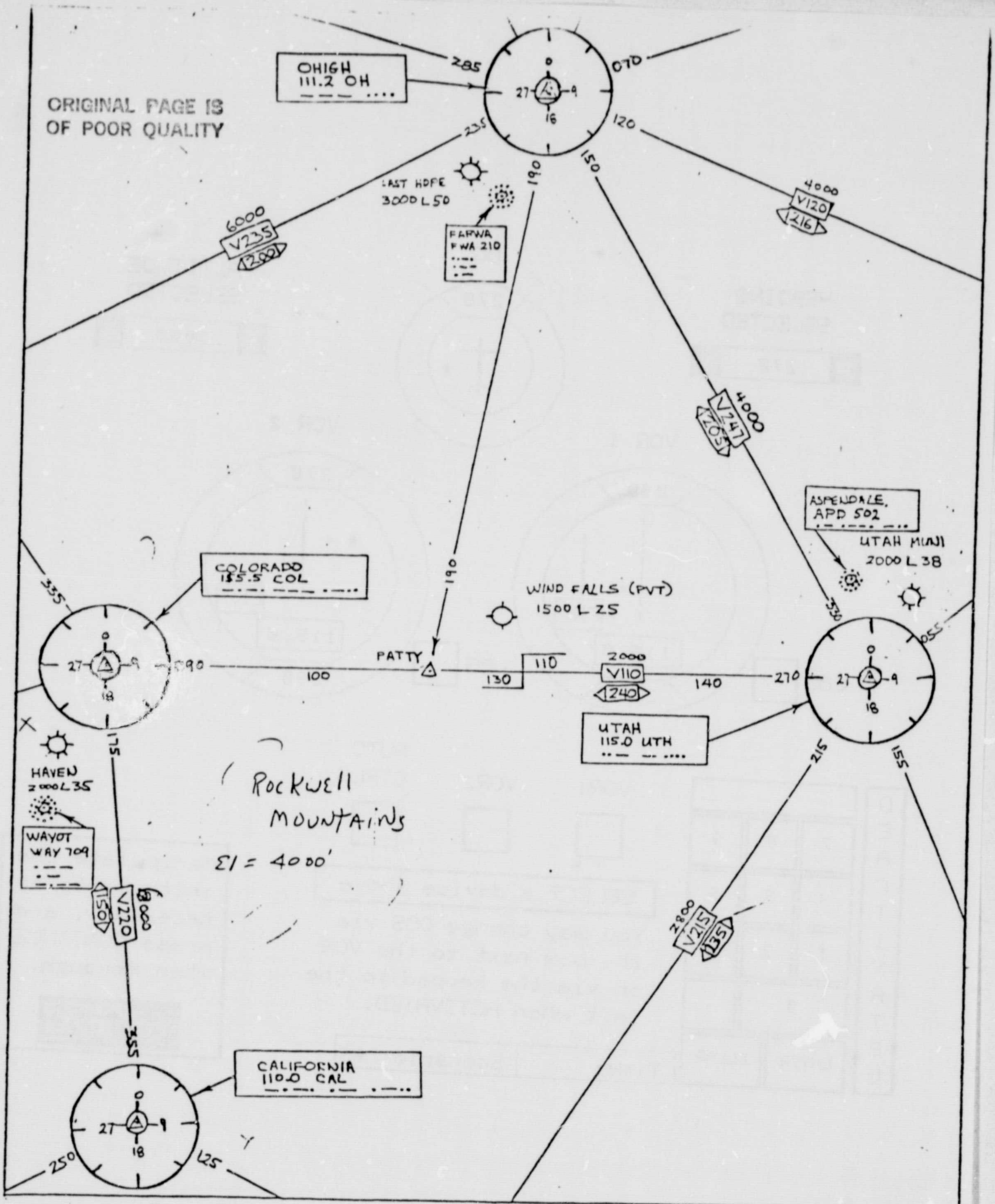
You have one passenger aboard.

Weather at:

Haven County Airport= 2000 & 5
Ohigh= 1000 & 3
Wind Falls= 1000 & 3 by a C-172
(10 minutes ago)

Cleve Center calls and reports radar contact is lost.
Please report present position.

CONTINUE	When ready, press the CONTINUE button to go to the VOR display to establish position.


OHIGH
111.2 OH
285
070
235
120
190
150
LAST HOPE
3000 L 50
FARWA
FWA 210
6000
V235
200
4000
V120
216
V247
205
4000
ASPENDALE
APD 502
UTAH MUNI
2000 L 38
COLORADO
155.5 COL
335
090
100
PATTY
190
WIND FALLS (PVT)
1500 L 25
130
110
2000
V110
240
140
270
330
055
UTAH
115.0 UTH
215
155
175
HAVEN
2000 L 35
WAYOT
WAY 709
150
V220
8000
Rockwell
Mountains
EI = 4000'
2800
V215
135
355
CALIFORNIA
110.0 CAL
250
125

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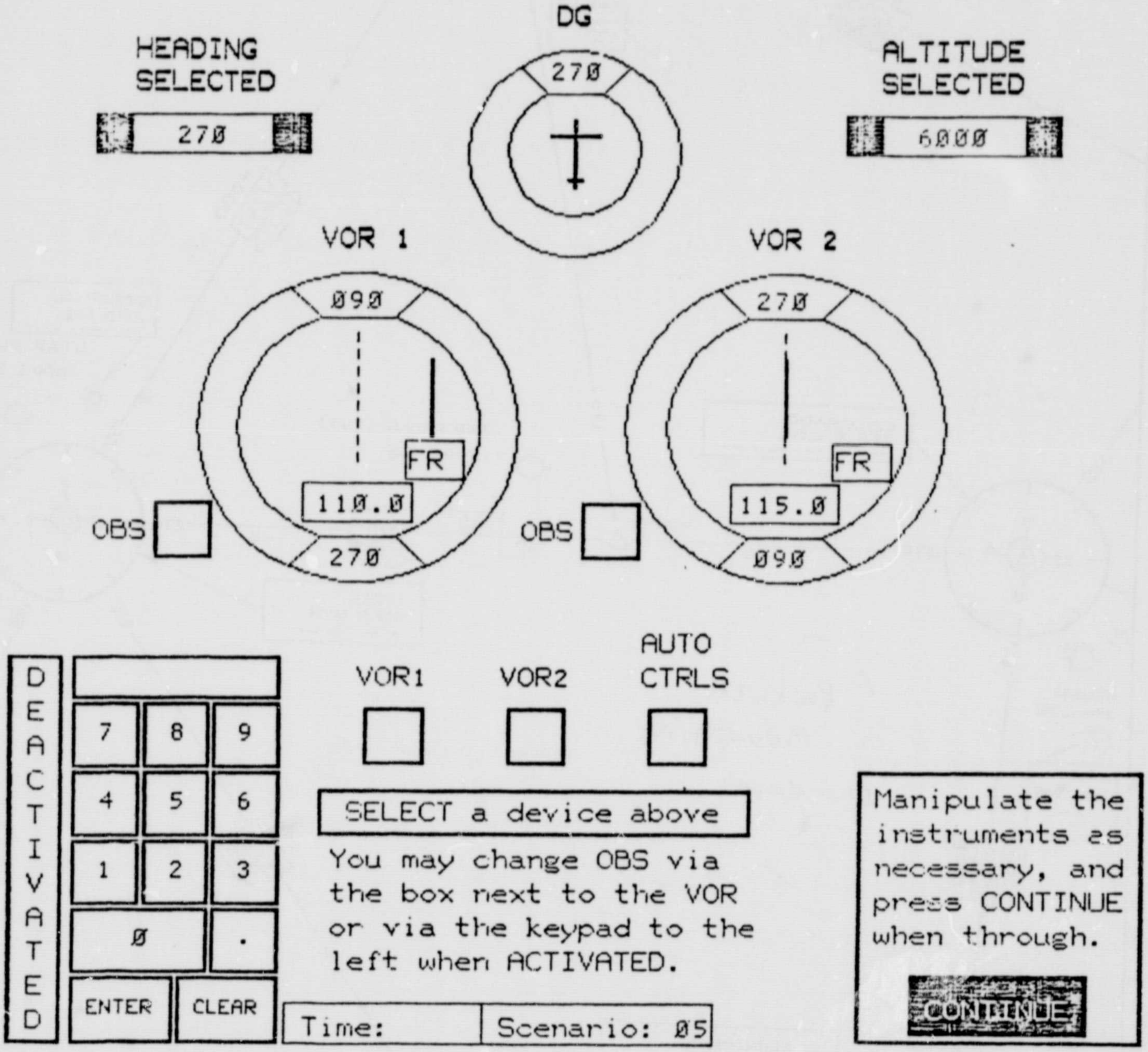


POSITION REPORT

Please report your position by pressing the TO or FR buttons for the VOR of your choice. (Choose at least two VORs).

Type in your position via the keyboard at the given arrow, then press the NEXT key to enter it.

California VOR	TO	4Ø ok	FR	
Utah MunAir VOR	TO		FR	26Ø ok
Ohigh VOR	TO		FR	

Press CONTINUE after you have made your report

CONTINUE

Last Clearance

ATC Response:

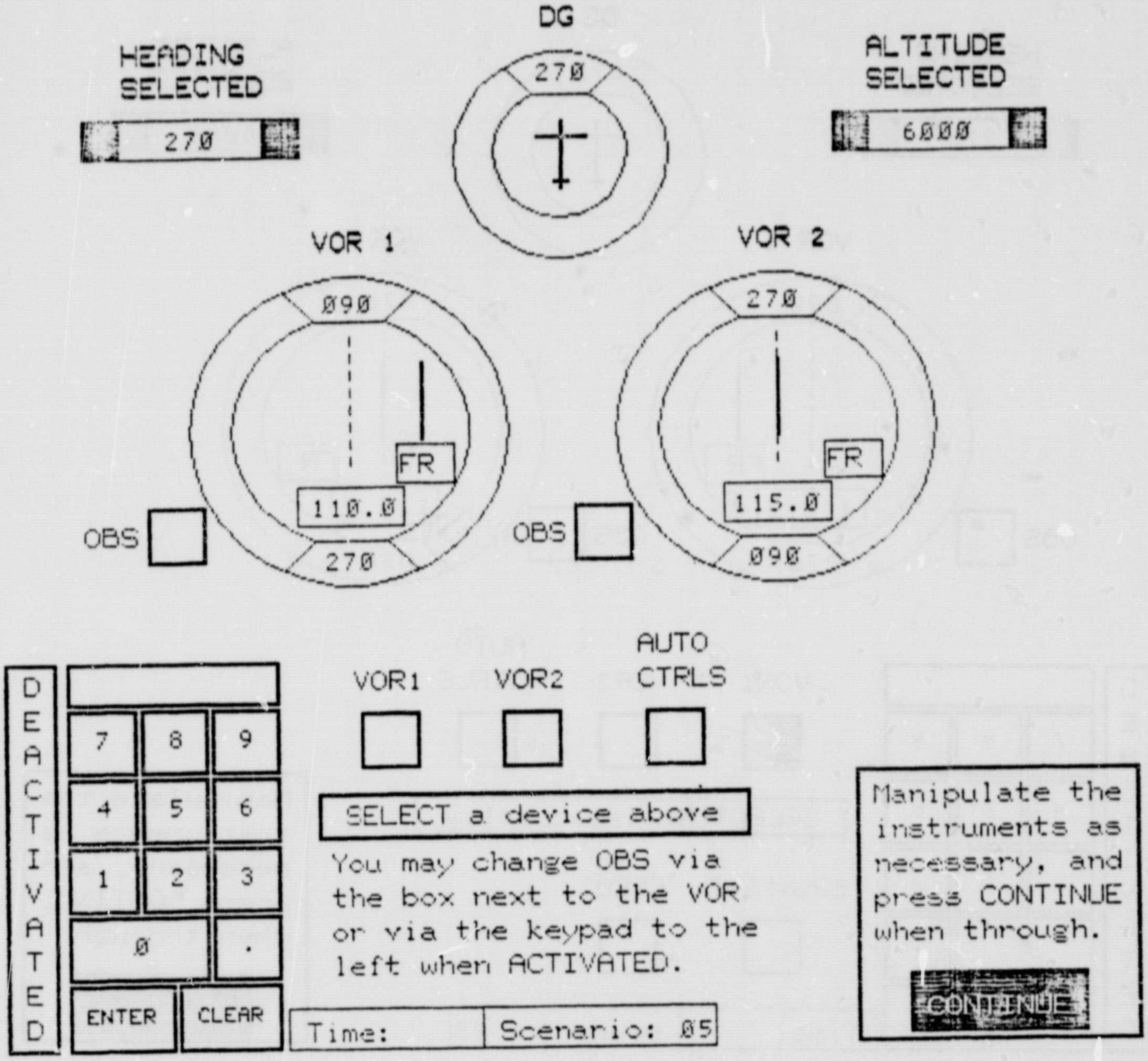
N123B, thanks for the position report.
Here is your new clearance:
proceed direct California VOR direct
Haven County Airport at 6000.

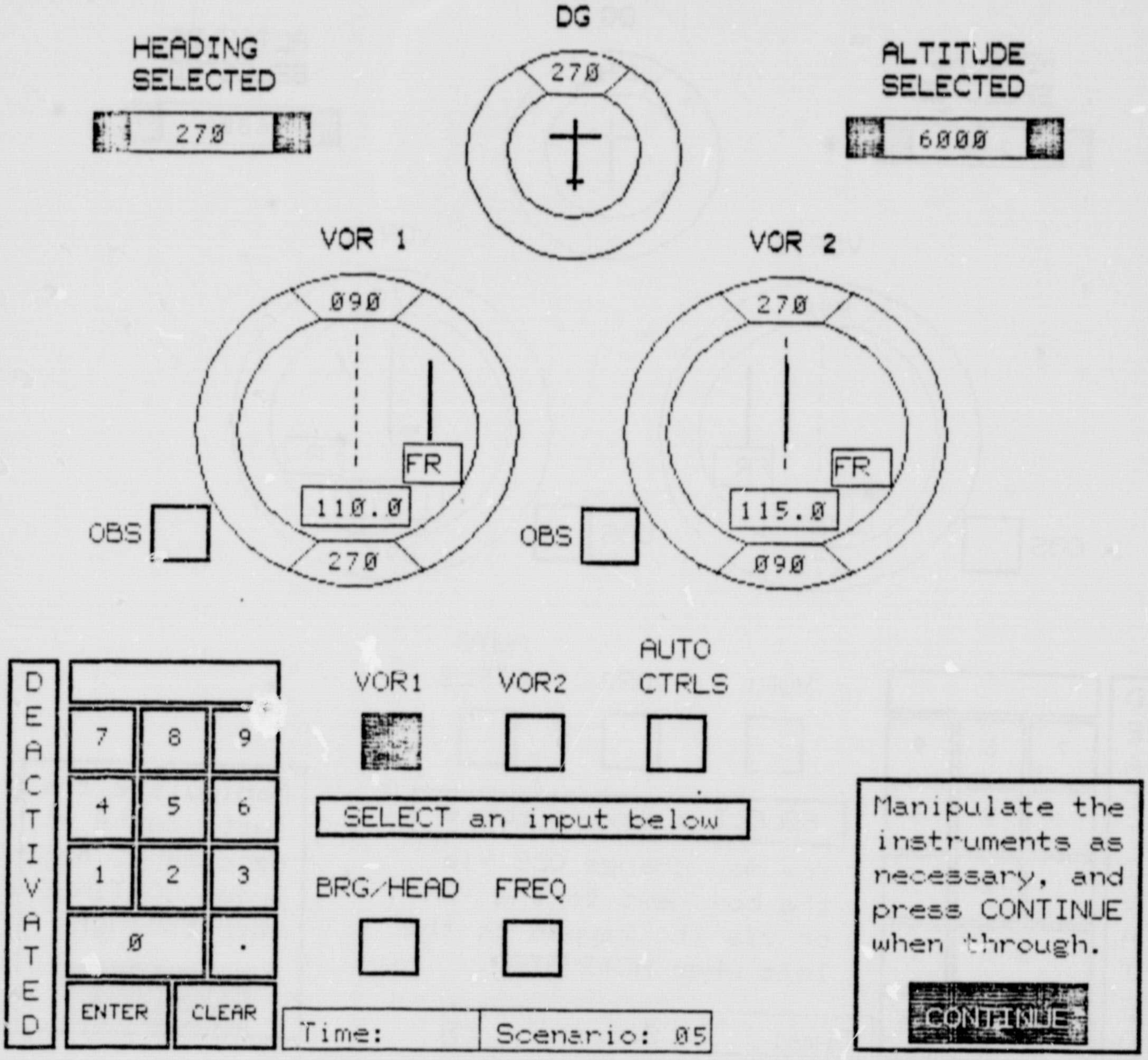
There will be opposite traffic
at 5000...maintain 6000.

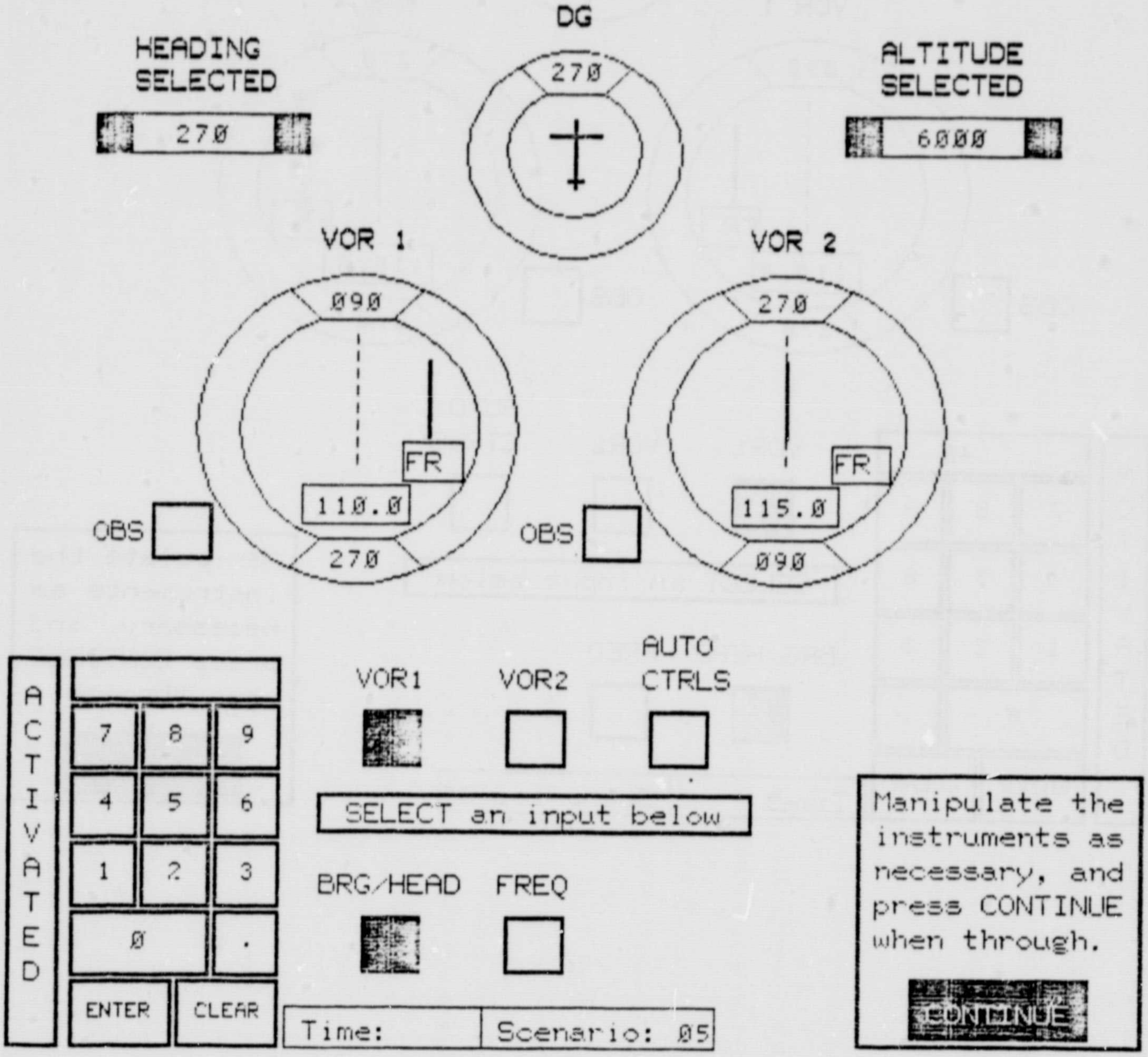
Please confirm your new heading
and altitude after your turn.

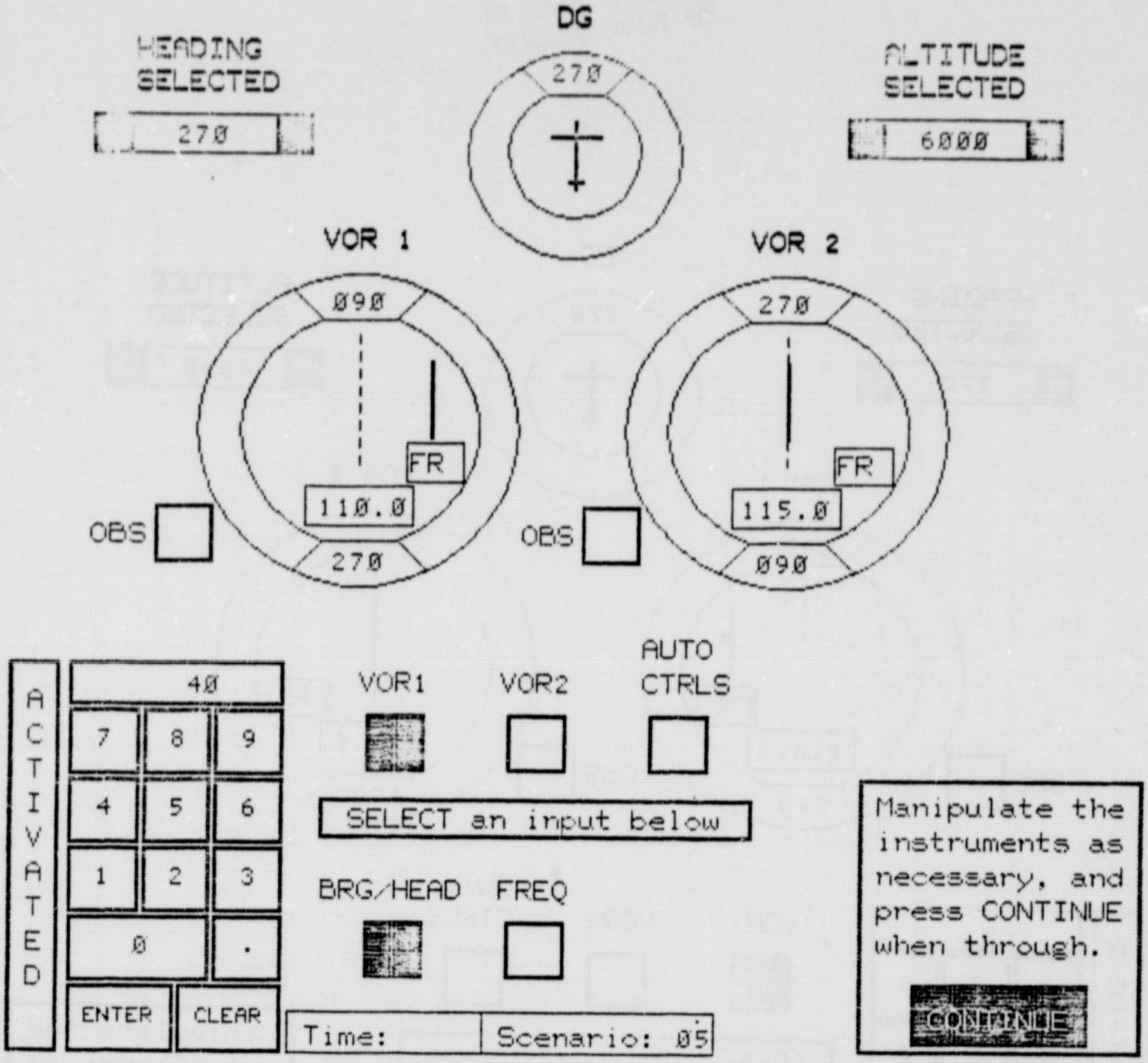
VOR auto	ATC Comm
Decision	Int Info
Scenario	Ext Info
	Instr Panel

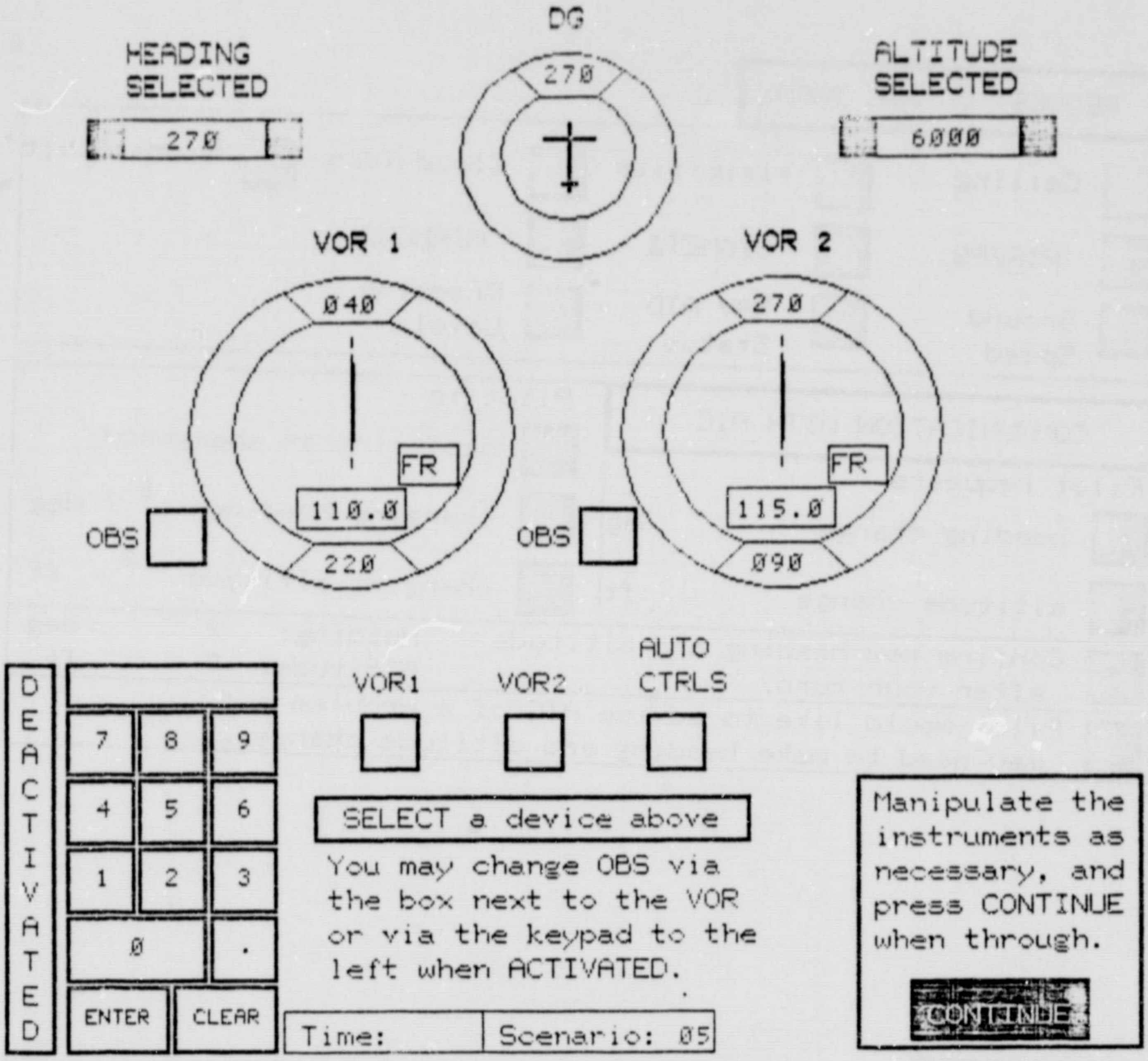
Time: 7:31	Scenario: 05


DG
270
HEADING SELECTED
270
ALTITUDE SELECTED
6000
VOR 1
090
FR
110.0
270
OBS
VOR 2
270
FR
115.0
090
OBS
DEACTIVATED
7 8 9
4 5 6
1 2 3
0 .
ENTER
CLEAR
VOR1
VOR2
AUTO CTRLS
SELECT a device above
You may change OBS via the box next to the VOR or via the keypad to the left when ACTIVATED.
Time:
Scenario: 05
Manipulate the instruments as necessary, and press CONTINUE when through.
CONTINUE


DG
270
HEADING
SELECTED
270
ALTITUDE
SELECTED
6000
VOR 1
090
FR
110.0
270
OBS
VOR 2
270
FR
115.0
090
OBS
DEACTIVATED
7
8
9
4
5
6
1
2
3
0
.
ENTER
CLEAR
VOR1
VOR2
AUTO
CTRLS
SELECT an input below
BRG/HEAD
FREQ
Time:
Scenario: 05
Manipulate the instruments as necessary, and press CONTINUE when through.
CONTINUE


HEADING
SELECTED
270
DG
270
ALTITUDE
SELECTED
6000
VOR 1
090
FR
110.0
270
OBS
VOR 2
270
FR
115.0
090
OBS
ACTIVATED
7
8
9
4
5
6
1
2
3
0
.
ENTER
CLEAR
VOR1
VOR2
AUTO
CTRLS
SELECT an input below
BRG/HEAD
FREQ
Time:
Scenario: 05
Manipulate the
instruments as
necessary, and
press CONTINUE
when through.
CONTINUE


DG
270
HEADING SELECTED
270
ALTITUDE SELECTED
6000
VOR 1
090
FR
110.0
270
OBS
VOR 2
270
FR
115.0
090
OBS
ACTIVATED
40
7
8
9
4
5
6
1
2
3
0
.
ENTER
CLEAR
VOR1
VOR2
AUTO CTRLS
SELECT an input below
BRG/HEAD
FREQ
Time:
Scenario: 05
Manipulate the instruments as necessary, and press CONTINUE when through.
CONTINUE


DG
270
HEADING
SELECTED
270
ALTITUDE
SELECTED
6000
VOR 1
040
FR
110.0
220
OBS
VOR 2
270
FR
115.0
090
OBS
D
E
A
C
T
I
V
A
T
E
D
7
8
9
4
5
6
1
2
3
0
.
ENTER
CLEAR
VOR1
VOR2
AUTO
CTRLS
SELECT a device above
You may change OBS via
the box next to the VOR
or via the keypad to the
left when ACTIVATED.
Time:
Scenario: 05
Manipulate the
instruments as
necessary, and
press CONTINUE
when through.
CONTINUE

REQUEST OF ATC INFO

☐ Ceiling	☐ Visibility	☐ Cloud Tops	☐ Winds Aloft
☐ PIREPS	☐ SIGMETS	☐ AIRMETS	
☐ Ground Speed	☐ NAV AID Status	☐ Freezing Level	

COMMUNICATION WITH ATC

Pilot requests	Pilot is
	☐ declaring an emergency
☐ heading change deg	☐ changing heading Ø deg
☐ altitude change ft	☐ changing altitude Ø ft

☐ Confirm new heading and altitude after your turn. Heading: Ø deg Altitude: Ø ft

☐ Pilot would like to advise ATC of a problem and may need to make heading and altitude changes.

CONTINUE

C-2

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REQUEST OF ATC INFO

Ceiling	Visibility	Cloud Tops	Winds Aloft
PIREPS	SIGMETS	AIRMETS	
Ground Speed	NAV AID Status	Freezing Level	

COMMUNICATION WITH ATC

Pilot requests		Pilot is	
heading change	deg	declaring an emergency	
altitude change	ft	changing heading	4Ø ok deg
		changing altitude	55ØØ ok ft

Confirm new heading and altitude after your turn. Heading: Ø deg Altitude: Ø ft

Pilot would like to advise ATC of a problem and may need to make heading and altitude changes.

ATC response:
Understand declaring
emergency enter heading
or altitude change

CONTINUE

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SCENARIO CHANGE

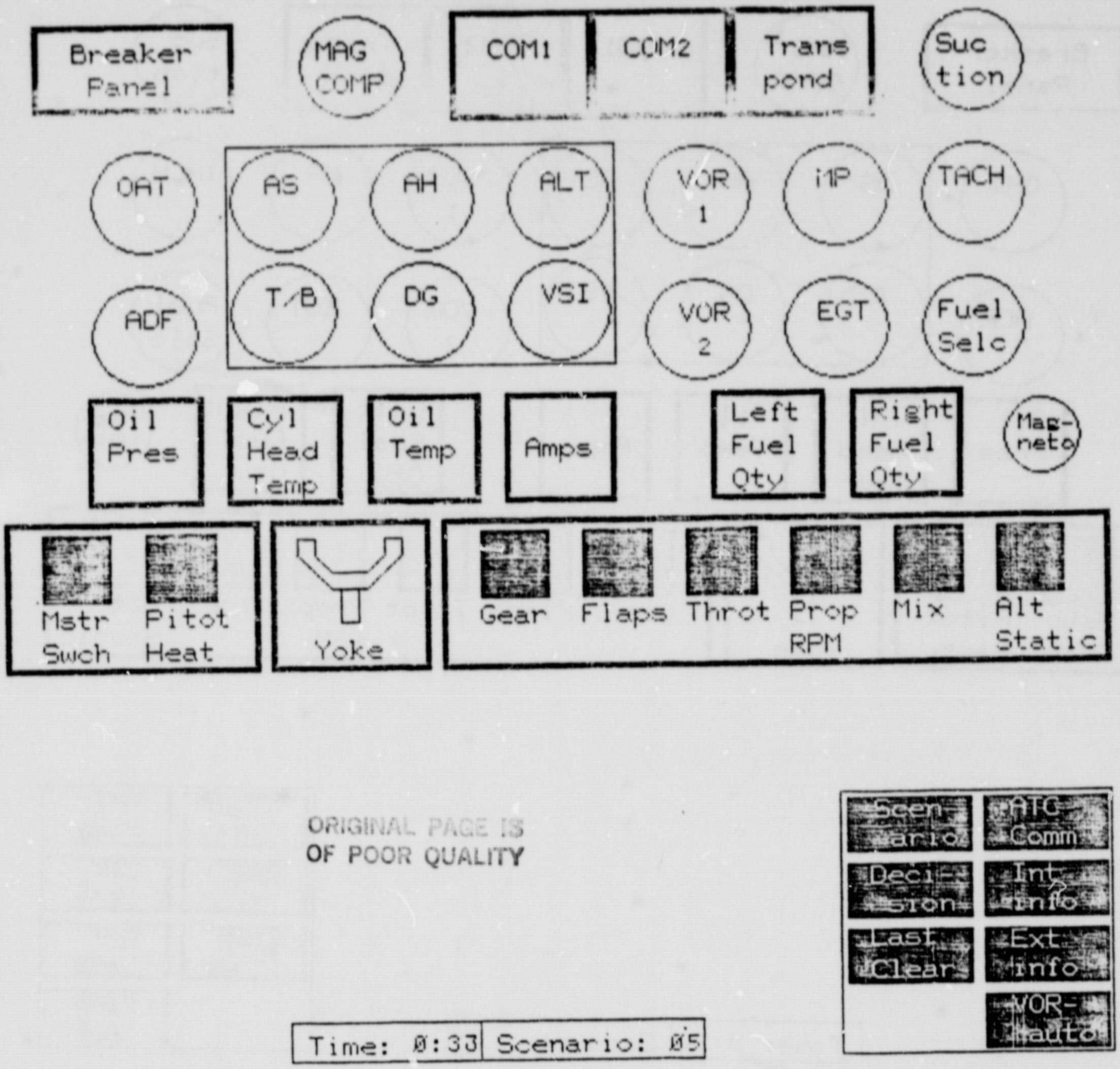
While practicing hand flying with your autopilot disengaged, you notice that increased nose-up trim is required to maintain a constant indicated altitude and that your IAS has decreased 20kts. from normal cruise.

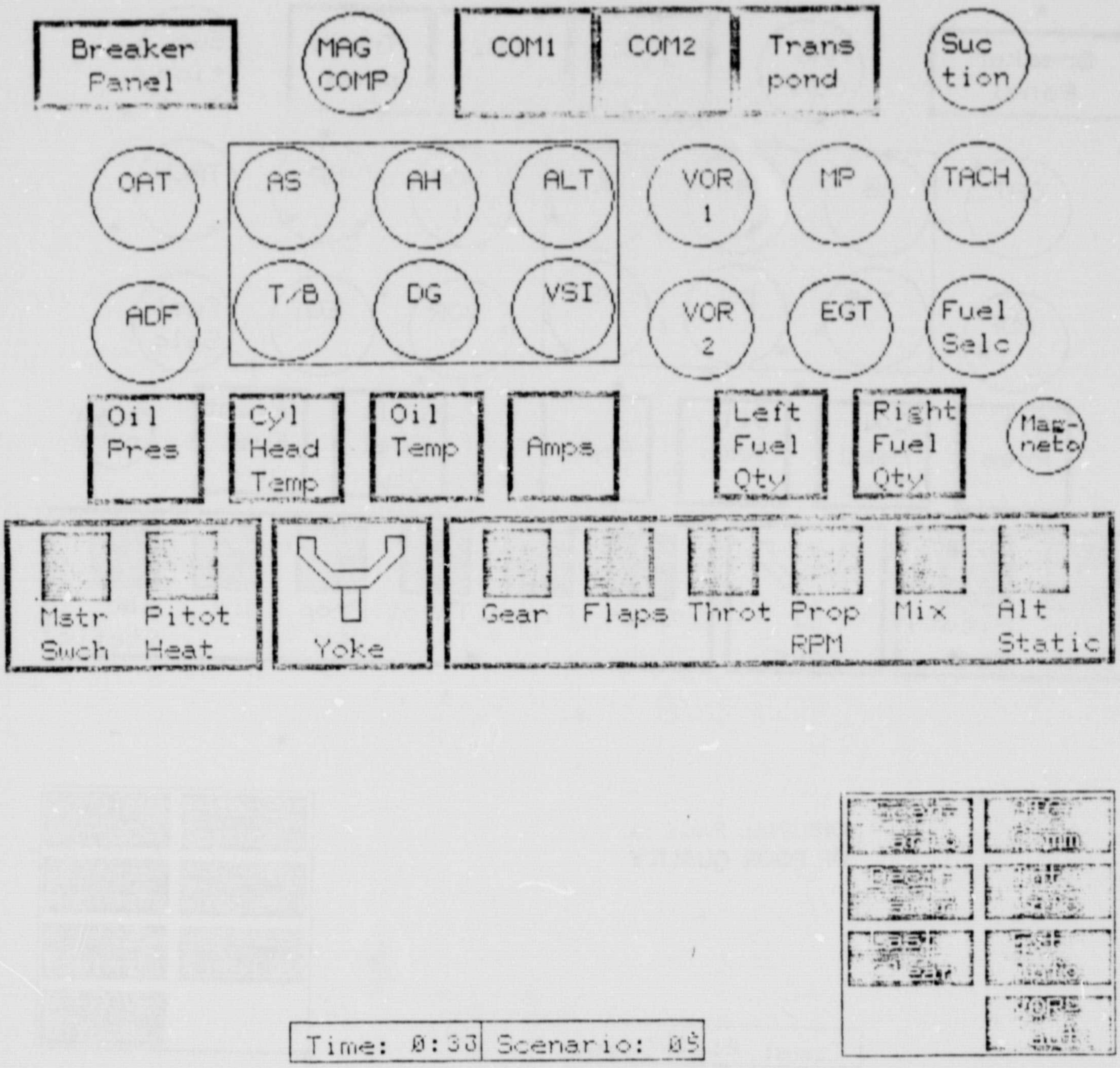
Your passenger notes this problem, and suggests that you turn back to Utah Municipal.

Determine the nature of the problem, and your destination decision.

Time:	Scenario: Ø5

VOR auto	ATC Comm
Deci-sion	Int Info
Last Clear	Ext Info
	Instr Panel


Breaker Panel
MAG COMP
COM1
COM2
Transpond
Suction
OAT
AS
AH
ALT
VOR 1
MP
TACH
ADF
T/B
DG
VSI
VOR 2
EGT
Fuel Selc
Oil Pres
Cyl Head Temp
Oil Temp
Amps
Left Fuel Qty
Right Fuel Qty
Magneto
Mstr Swch
Pitot Heat
Yoke
Gear
Flaps
Throt
Prop RPM
Mix
Alt Static
Scenario
ATC Comm
Decision
Int info
Last Clear
Ext info
VOR-auto
Time: 0:33
Scenario: 05



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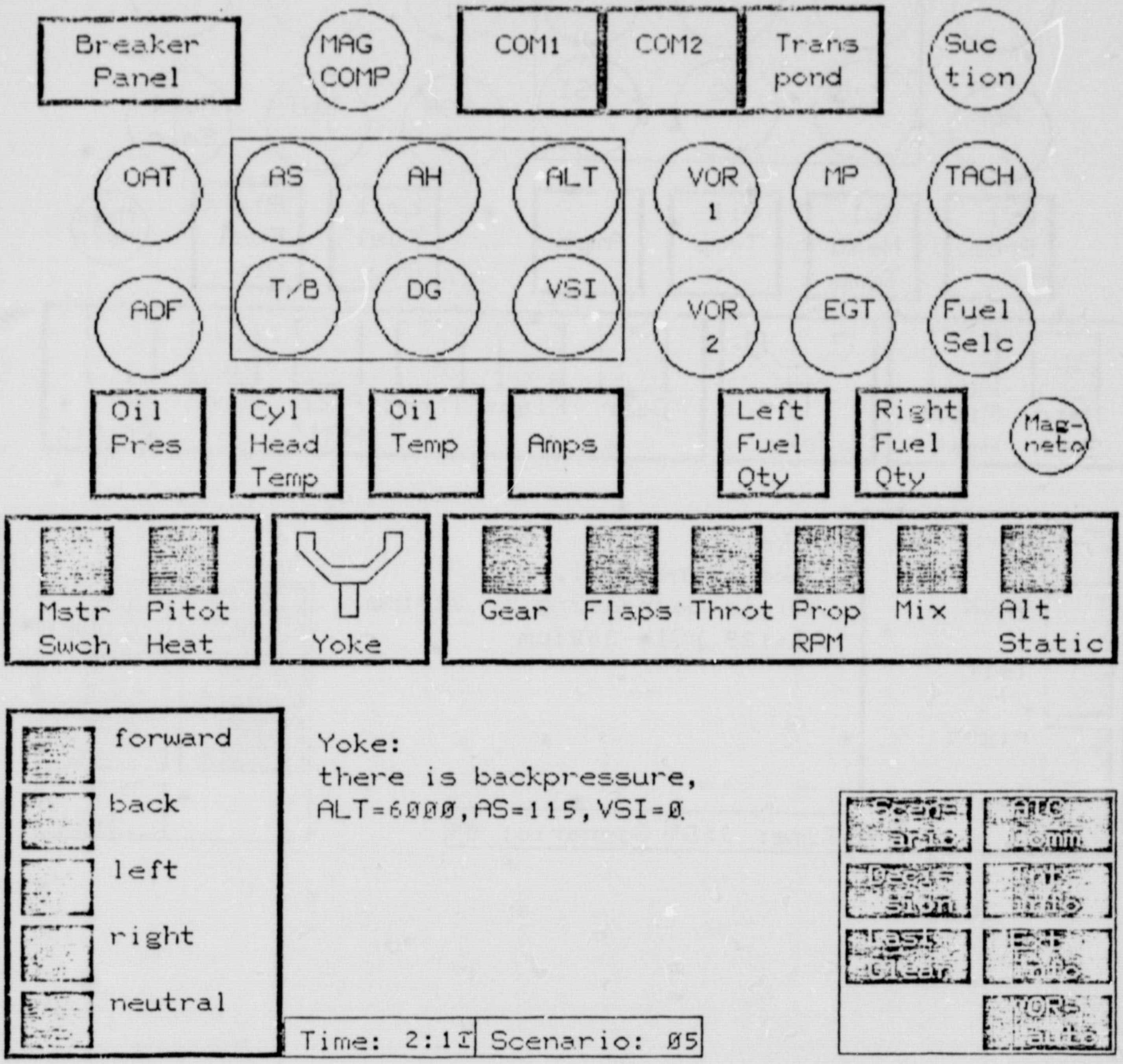

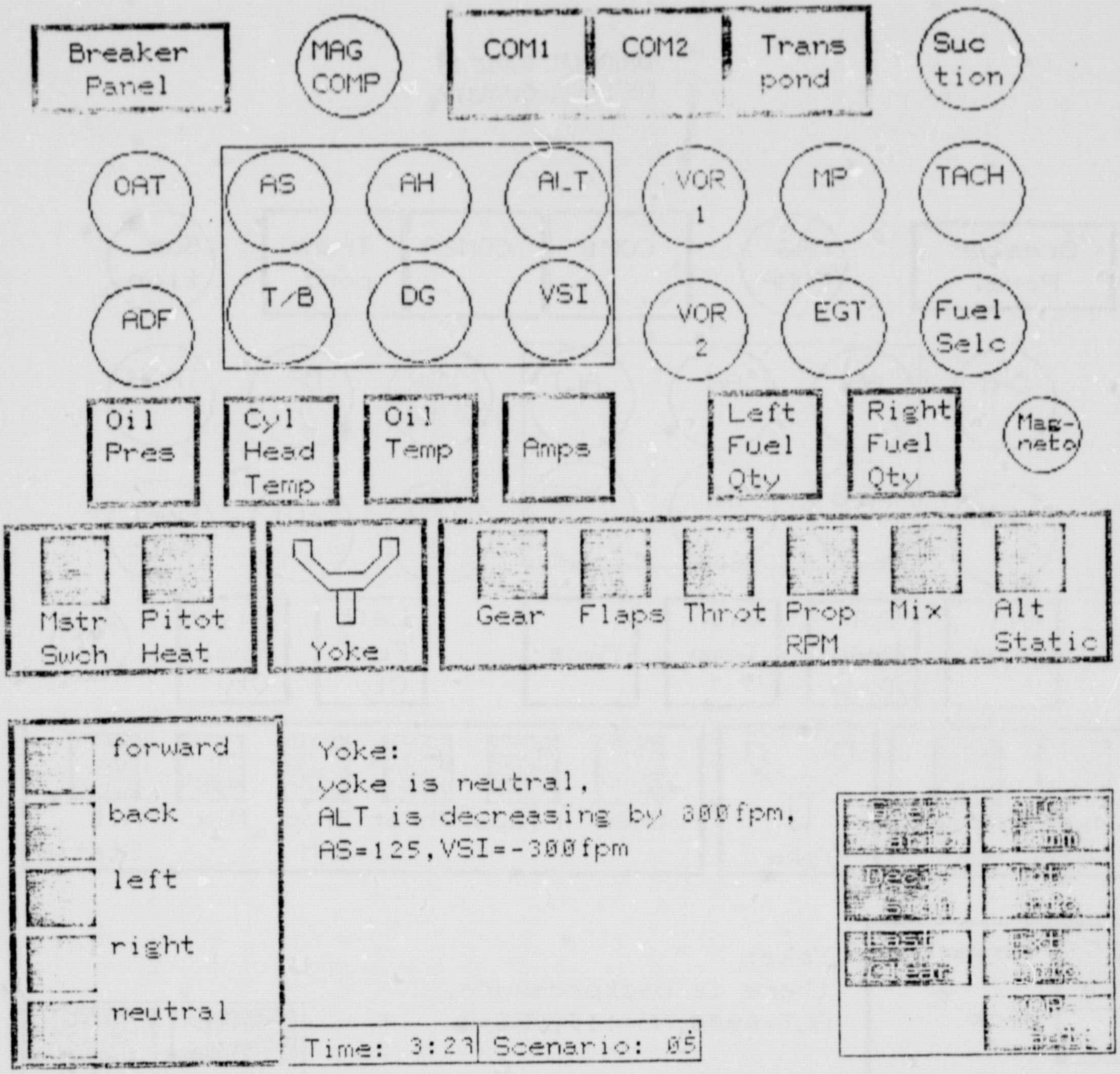

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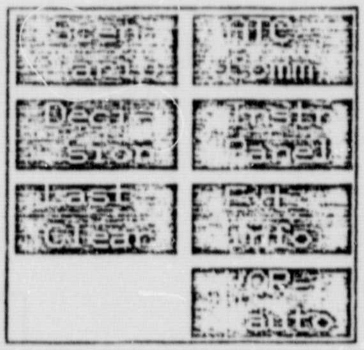
Information for Inside Cabin Conditions

Cargo Condition	Door Condition	Panel Temp Condition
Cabin Temp Condition	Housekeeping Condition	
Smoke	Fluid Leaks	Noise & Vibration

Housekeeping Condition:

no loose items



Time: 4:70	Scenario: 05

Information for External Conditions

Cowling Condition	Windscreen Condition	Wing Condition
Flap Condition	Aileron Condition	Stabilator Condition

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Cowling Condition:

clean and secure

Scen-ario	ATC Comm
Deci-sion	Int info
Last Clear	VOR auto
	Instr Panel

Time: 4:46	Scenario: Ø5

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REQUEST OF ATC INFO

[ ] Ceiling	[ ] Visibility	[ ] Cloud Tops	[ ] Winds Aloft
[ ] PIREPS	[ ] SIGMETS	[ ] AIRMETS	
[ ] Ground Speed	[ ] NAV AID Status	[ ] Freezing Level	

COMMUNICATION WITH ATC

Pilot requests

- [ ] heading change deg
- [ ] altitude change ft

Pilot is

- [ ] declaring an emergency
- [ ] changing heading 40 deg
- [ ] changing altitude 5500 ft

[ ] Confirm new heading and altitude after your turn. Heading: 0 deg Altitude: 0 ft

[ ] Pilot would like to advise ATC of a problem and may need to make heading and altitude changes.

[illegible]	[illegible]
[illegible]	[illegible]
Last Clear	[illegible]
	[illegible]

Time: 5:23	Scenario: 05

PEQUEST OF ATC INFO

Ceiling	Visibility	Cloud Tops	Winds Aloft
PIREPS	SIGMETS	AIRMETS	
Ground Speed	NAV AID Status	Freezing Level	

COMMUNICATION WITH ATC

Pilot requests

- heading change deg
- altitude change ft

Pilot is

- declaring an emergency
- changing heading 40 deg
- changing altitude 5500 ft

Confirm new heading and altitude after your turn. Heading: 0 deg Altitude: 0 ft

Pilot would like to advise ATC of a problem and may need to make heading and altitude changes.

Understand you are having a problem... keep us advised

Time: 6:13	Scenario: 05

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REQUEST OF ATC INFO			
[ ] Ceiling	[ ] Visibility	[ ] Cloud Tops	[ ] Winds Aloft
[ ] PIREPS	[ ] SIGMETS	[ ] AIRMETS	
[ ] Ground Speed	[ ] NAV AID Status	[ ] Freezing Level	

COMMUNICATION WITH ATC	Pilot is
Pilot requests	[ ] declaring an emergency
[ ] heading change deg	[ ] changing heading 40 deg
[ ] altitude change ft	[ ] changing altitude 5500 ft

[ ] Confirm new heading and altitude after your turn.	Heading: 0 deg Altitude: 0 ft
[ ] Pilot would like to advise ATC of a problem and may need to make heading and altitude changes.	

Cloud Tops:

area forecast

14000 ft

Time: 6:59	Scenario: 05

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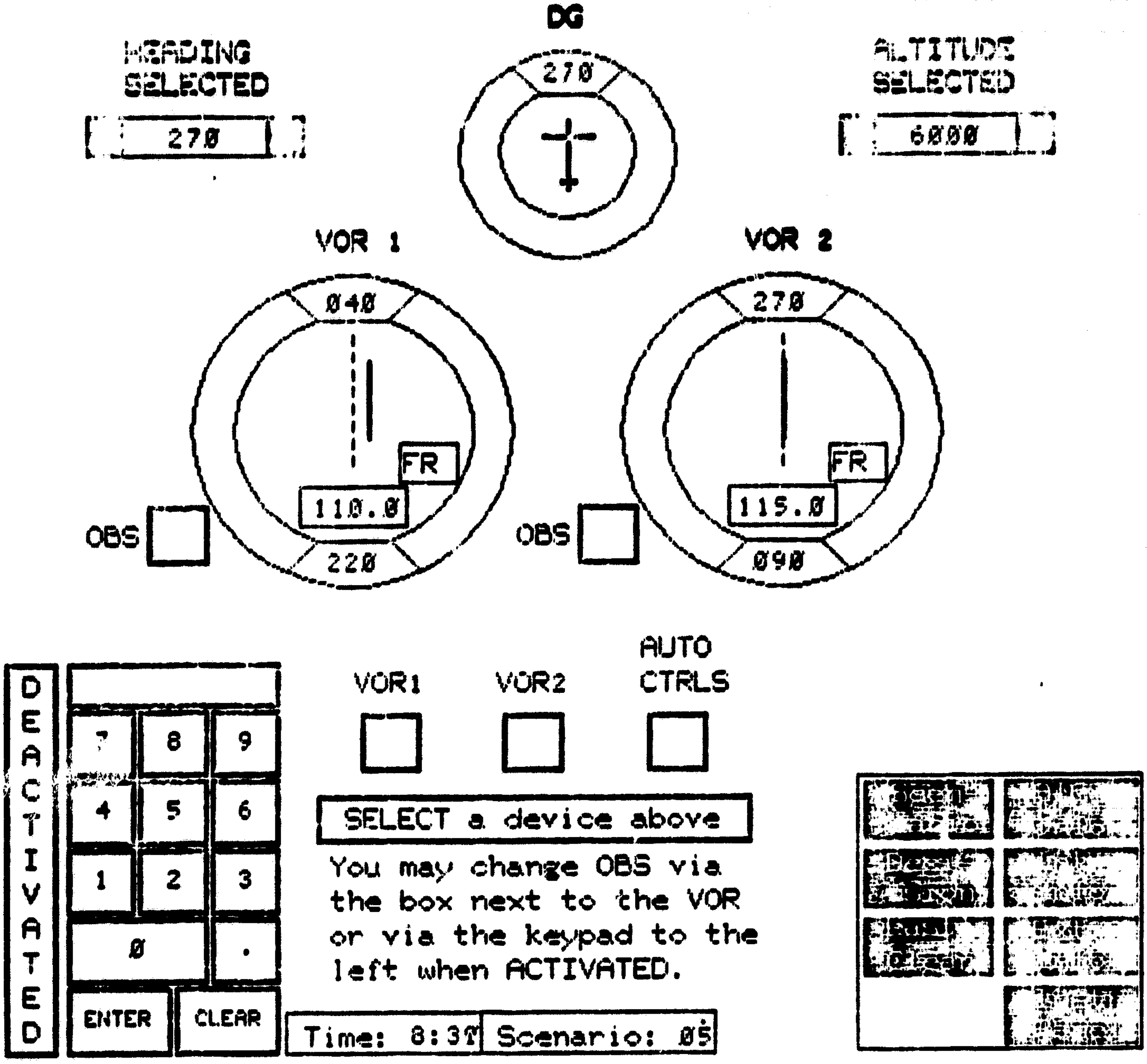

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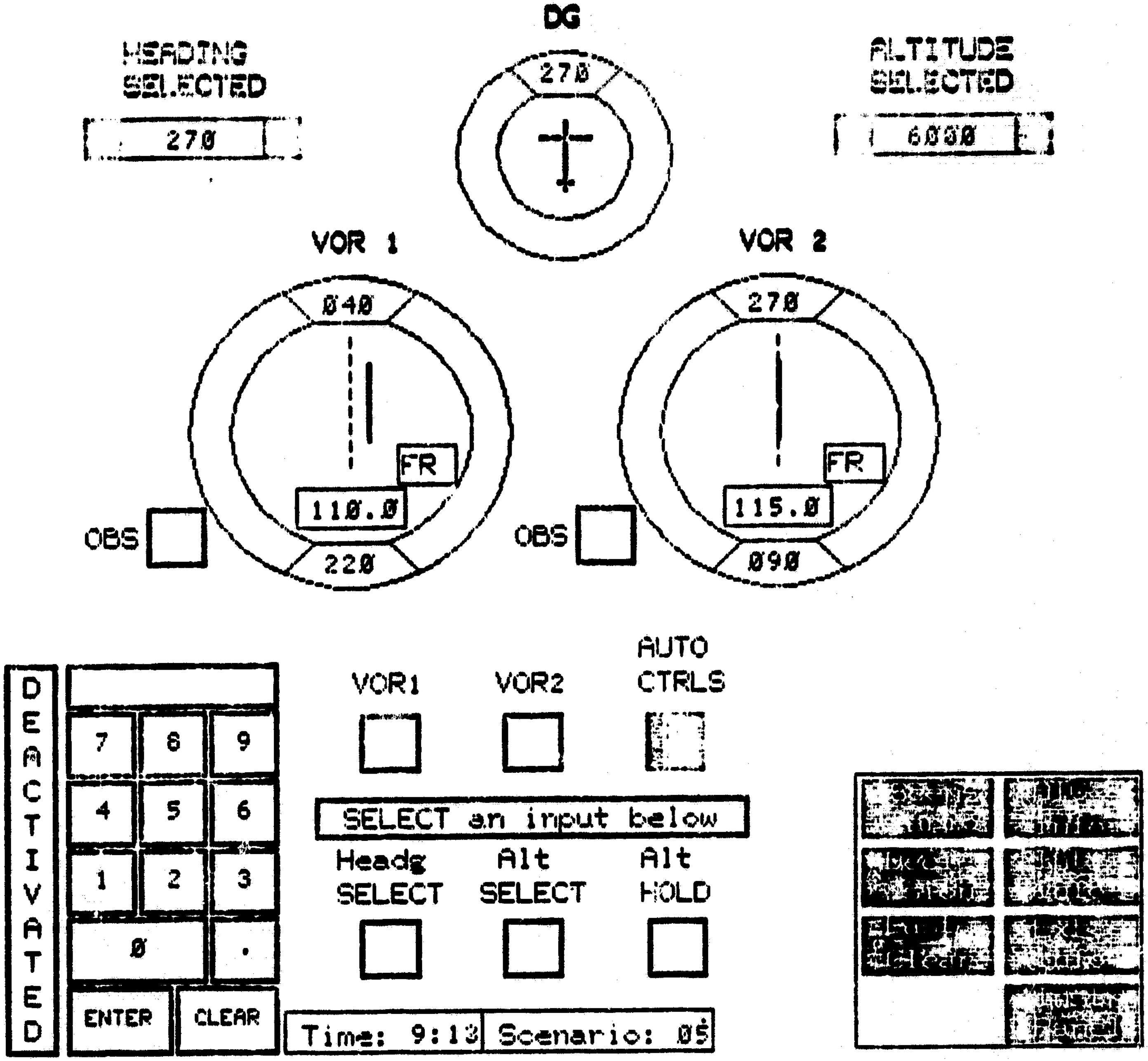

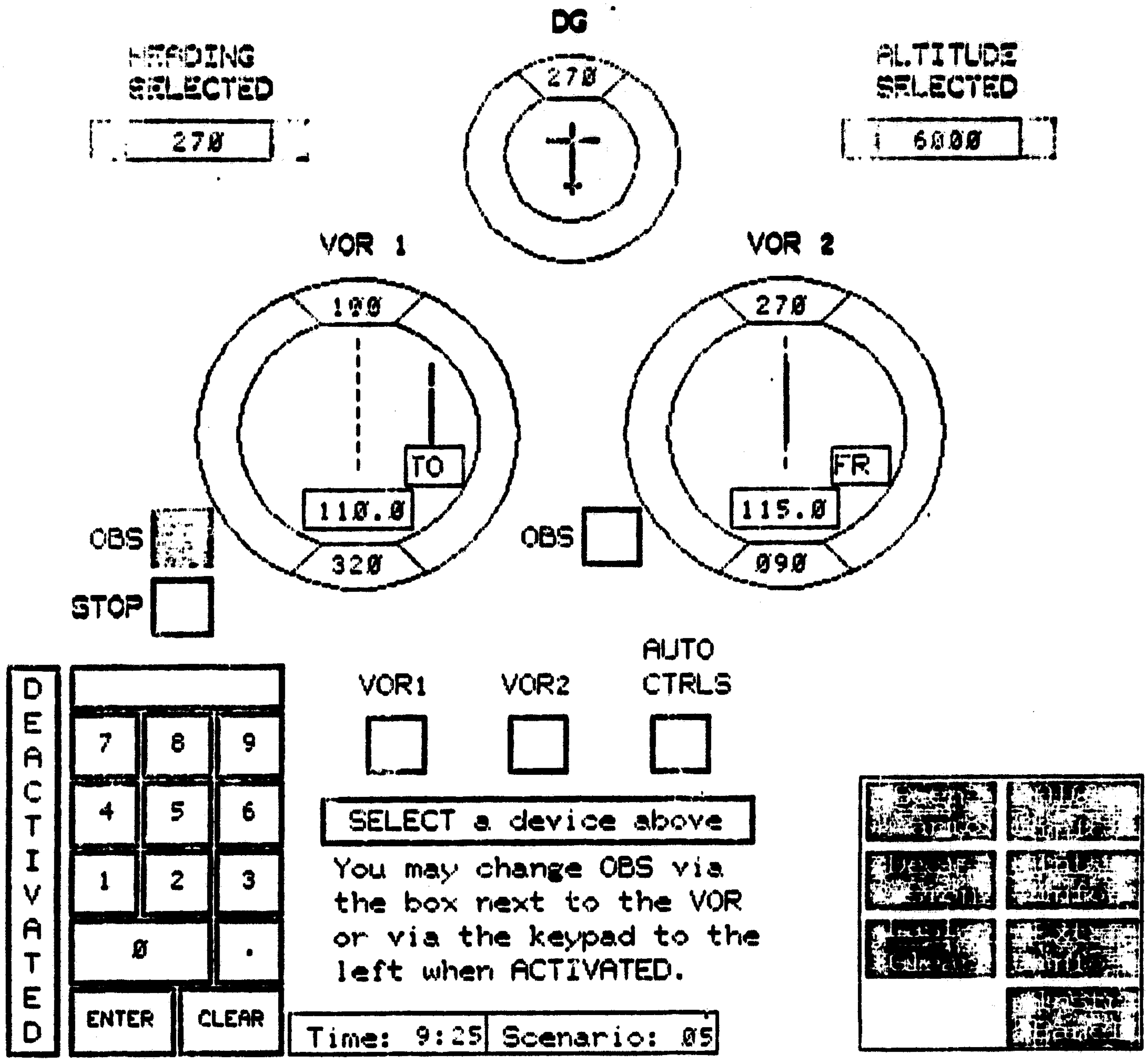

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Instr Panel

ATC Comm

Int Info

Ext Info

Scen- ario

VOR- autopilot

Last Clear

Deci- sion

You have come to a decision

If you are ready to declare your aircraft destination and diagnosis:

then touch the Decision button above

else touch an alternative button to continue the test.

Time: 7:5[illegible]	Scenario: Ø5

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Please enter your destination decision
via the keyboard.

home port ok

Please enter the estimated time to your destination

$\boxed{\text{a)}}$ Ø - 3Ø minutes

b) 3Ø - 6Ø minutes

c) 6Ø - 9Ø minutes

d) greater than 9Ø minutes

When you have made your final SELECTION:

$\boxed{\text{ENTER}}$

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1	aileron	26	elevator	51	landing	76	[illegible]
2	alternator	27	engine	52	leaking	77	rudder
3	altimeter	28	exhaust	53	lean	78	screen
4	baffle	29	failure	54	left	79	screw
5	battery	30	filter	55	line	80	seal
6	belt	31	fire	56	loose	81	seizure
7	blocked	32	flap	57	lost	82	smoke
8	bottom	33	flow	58	low	83	starter
9	broken	34	fouled	59	magneto	84	starvation
10	burst	35	frozen	60	mixture	85	static
11	cabin	36	fuel	61	motor	86	structural
12	cap	37	gasket	62	none	87	stuck
13	carburetor	38	gauge	63	oil	88	suction
14	C/B fuse	39	gear	64	partial	89	switch
15	complete	40	governor	65	pedal	90	tank
16	condenser	41	gyro	66	piston	91	temp.
17	control	42	heat	67	pitot	92	throttle
18	cold	43	high	68	plugs	93	tip
19	cowling	44	hot	69	points	94	top
20	crankshaft	45	hydraulic	70	popped	95	vacuum
21	cylinder	46	ice	71	power	96	valve
22	don't know	47	ignition	72	pressure	97	vapor
23	door	48	induction	73	prop	98	vibration
24	drive	49	instrument	74	pump	99	wing
25	electrical	50	jets	75	right		

don't know

1 2 3 [illegible]

4 5 6 0

STORE ANSWER   ERASE WORD   7 8 9 [illegible]

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Appendix F

CIFE Data Collection/Subject Testing System

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OVERVIEW OF CIFE DATA COLLECTION/SUBJECT TESTING SYSTEM

The CIFE data collection/subject testing system was built using CDC's PLATO system (out 22). the hardware utilized was an IST-II PLATO terminal, that has graphics capability and a touch sensitive CRT screen (touch panel). The CRT's graphics has a resolution of 512x512 dots. The CRT's text display capability is 32 lines, with 64 alphanumeric characters to a line. The CRT's touch panel has a resolution of 16x16 touch sensitive coordinates.

The PLATO terminal allows access to the PLATO system via a local telephone dial-up style communication port. Connecting to the local port allows communication to the PLATO computer that is located out of state.

The CIFE data collection/subject testing system was realized by a system of custom-built programs, that can test a subject, record pertinent data from the subject's responses, and [illegible] the collected data. The design, coding and testing of the initial version of the system took approximately 18 weeks of manpower. An average of 3 weeks of manpower was required for each research module created. The programming language used was TUTOR, the exclusive PLATO programming language.

The current version of the software system consists of 8 program modules and 3 sequential data files. In addition, there are 5 subroutine programs that may be accessed (in cife3) to edit one of the data files.

Control of the software system is maintained via the main program module called the 'router'. The router allows access to all of the other modules and is also responsible for initializing access to the data files. Access to the router for subject testing is achieved by using a special 'student' signon to the PLATO system. The student signon restricts the user to a 'program execution only' mode of operation and assures a high priority in the PLATO system's job queue.

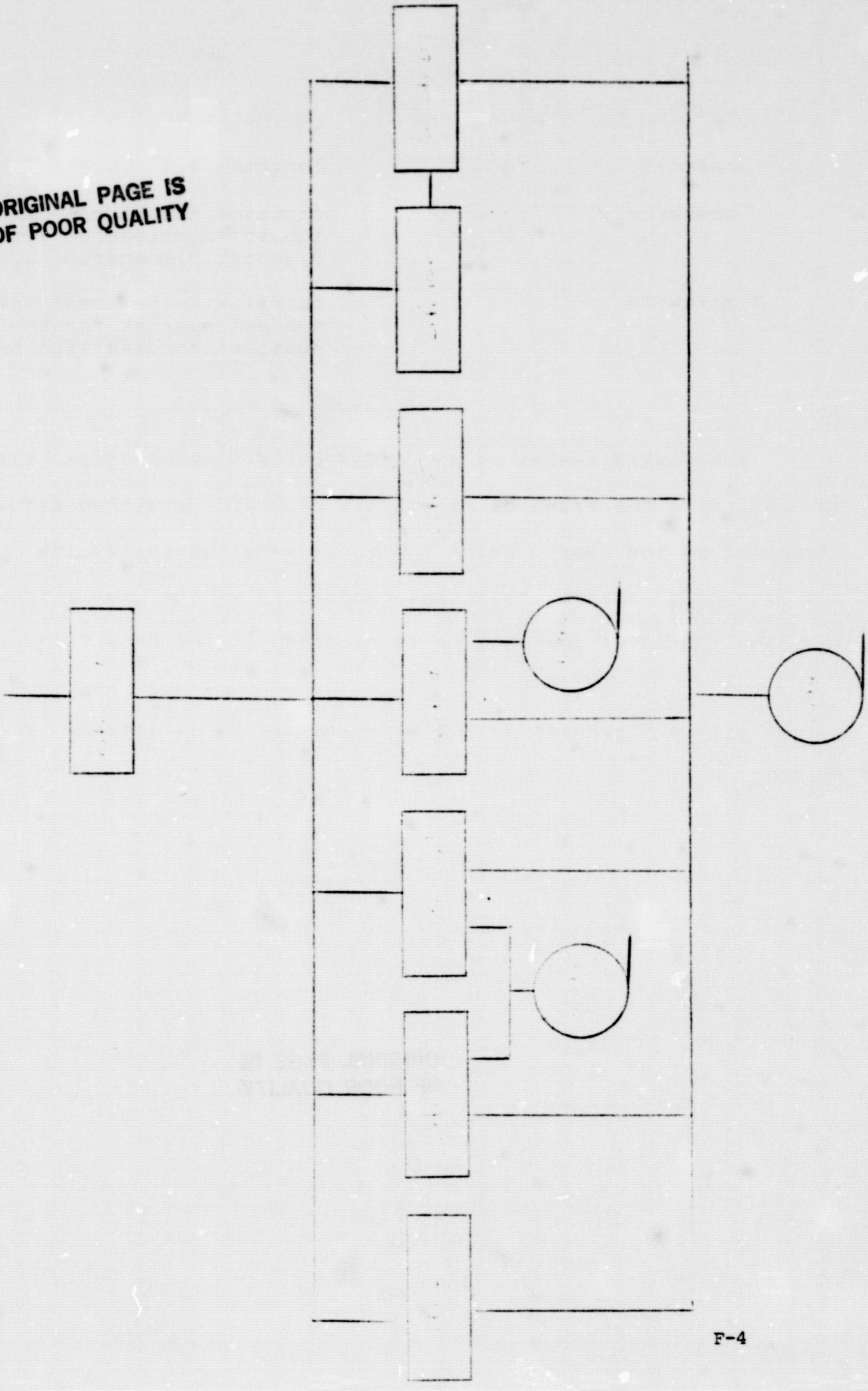
The software system by program module and data file is as follows:

PROGRAM MODULE	LOGICAL FUNCTION
ciferout	router
cife1	biographical survey test and knowledge survey test
cife3	diagnostic scenario test
cife4	destination-diversion test
cife5	airport ranking test
cifevor	dynamic VOR module
acife05	plan/ext diagnostic scenario test
datadisp	displays student data

DATA FILES	LOGICAL FUNCTION
resfle	contains all subject data
scenefle	contains system responses to subject queries for all diagnostic scenario tests
cife4fle	contains system responses to subject queries for the destination-diversion test

The software system is an interactive, menu-driven system. By utilizing the graphics capability of PLATO, stylized menus are presented to the user. Using the touch panel activates the menus and controls system response. Accordingly, the user's touch of the menu indicates the data to be recorded in the data file.

A simple flowchart of the software system's program modules follow.



Various problems were encountered during the development of the software system. Among these was the limitation of program size when the dynamics for excife05 were to be written. The Plato system allows a program to be approximately 8 lesson spaces (1 lesson space = 2240 60-bit words) in length. The excife05 required 12 lesson spaces, and needed special design considerations.

The design avoided the size limitations by breaking out the dynamics of the program into its own free standing program (cifevcr). The design however was not without a problem concerning the defining of variables and the passing of values between the two programs. The Plato system allows only one set of defined variables with a maximum capacity of 150 computer words to be active at any one time. Hence when control passes from one program to another, a new set of defined variables needs to be activated. It was necessary to accomodate the values to be passed between the two programs by reserving identical addresses for the passed variables. In this way, the toggling between the two sets of defined variables would not inadvertently destroy the contents of these variables.

Another problem encountered was the limitations of the touch panel of the CRT. A 'parallax' problem exists in the event of a subject sees the selection on the menu that he wants to touch, but when he tries to touch it, the touch panel does not sense it. The

problem is caused by the grid of the touch panel not being aligned with the menu on the screen and the subject's line of sight to the menu. In most instances, the subject was instructed to compensate for the problem by touching the menu somewhere off-center of his selection.

Another problem concerning the touch panel was the handling of accidental touches by the subject. Typically the subject would try to touch a selection on the menu, but by accident ('parallax' or otherwise) the wrong selection would be touched. This results in collecting unintended subject responses. No corrective measures were taken for this problem, other than considering these accidental touches as 'noise' in the data.

Another limitation that was encountered was the time the Plato system required to respond to successive touches to the touch panel. the Plato system requires a certain amount of time to sense a touch and then to generate a response to the CRT. Typically this response time for the Plato system is longer than the time needed for a subject to make successive touches. The result being that only the first touch is received by Plato and the second is ignored. Although this characteristic did not pose a problem during subject testing, it may cause frustration in the subject as he tries to rapidly request information from the CRT.

Originally the CIFE data collection/ subject testing system

was supposed to be a device that would be able to test subjects without the presence of an experimenter to help guide him through the operation of the system. A problem arose during the development that did not allow the software system to meet this criteria. The population of subjects that were to provide data were not familiar with computers so instructions of operation would be necessary. Although instructional sequences were provided for in the system, the systems's controls and responses were still too ambiguous for a subject to understand how to operate it. Also, the capturing of the subject's diagnosis of the scenarios proved to be hampered by the text limitations of the CRT. A lexicon of words is provided for the subject to create a diagnosis, but this approach is not capable of handling a subject's choice of words that are not contained in the lexicon. One hundred words can be accomodated in the lexicon, however it is felt that more words are needed to accomodate all subjects' choice of diagnoses.

The current software system is still of an experimental nature. Various improvements are necessary for the system to be of "production" status. One of the improvements would be the standardization of routines within programs. Some of the routines accomplish the same functions, yet do not share the same design. This would add unnecessary confusion during program maintenance. A standardization of the routines would help alleviate this problem. A similar problem exists in the defined variables of the

programs. Standardization of the set of defined variables would add greatly to the maintainability of the code.

Another improvement would be the utilization of micro-Plato for generating the various displays of the system. The IST-II terminal has the capability to down load an amount of micro-Plato program instructions into its local buffer. If the displays of the software system are converted to micro-Plato and down loaded into the local buffer, the generation of the displays would take only a fraction of the time that it currently takes. This feature would be desirable in light of the fact that subjects are somewhat impatient in waiting for a lengthly display to be generated.

The last improvement would be advantageous in getting the software system closer to an experimenter-free testing device. More attention should be given to the instruction sequences presented to the subject that demonstrate the operation of the system. Currently the sequences are not very successful in communicating with the subject. If a more detailed sequence of instructions that can accomodate and reduce the confusion of the subject can be developed, then perhaps the original criteria of an experimenter-free system can be met.

TO RUN A STUDENT/DEMO

Turn terminal on

Set data/talk switch to talk

Set brightness control

Call local Plato port (436-8550)

Listen for high pitched sound

Set data/talk switch to data

Loading sequence begins

Loading is complete when clock page appears

Enter Plato name student, press NEXT

Enter Plato group [illegible], press SHIFT-STOP

Sifenouter should execute and router displays appear

Select student or demo mode of operation

Termination of the program is done by selecting the last question item on the menu display.

TO RUN/ACCESS AN INDIVIDUAL PROGRAM

Turn on power and call up in the way explained previously

Enter Plato author name (such as rockwell), press NEXT

Enter Plato group name (osuens), press SHIFT-STOP

Author mode page should appear

Enter the desired program name,
press NEXT to access source code or press DATA to execute it

When in the source code, pressing SHIFT-STOP will execute the
program

When executing a program, pressing SHIFT-STOP will terminate the
program

When at the author mode page, pressing SHIFT-STOP will logout of
the account

CHANGING AN EXISTING DIAGNOSTIC SCENARIO

All editing of the diagnostic scenarios, including the plato/gat scenario, you must execute =pifa3= to access =scenefle= that contains all the responses to a test subject's queries of Plato. There exceptions to this in the case of the plato/gat scenario however. Some of the responses are hard-coded into =spcifaC3=.

The editing mode of =pifa3= is achieved by invoking SHIFT-TERM at the title page display of =pifa3=. By entering the correct "term word", the display that you wish to edit will be shown. The following list will show the relation between term words and displays.

Term word	Display to be edited
instrin	instrument panel
atcin	atc info display
intin	interior info display
extin	exterior info display
scenin	scenario display
diagin	scearric's diagnosis display

The editor for each of these displays works essentially the same, that is upon touching an item, such as a flight gauge on the instrument panel, the previously stored response is shown along with an arrow beneath the first line of text. The arrow will appear beneath each line of text as you complete the editing of that line. A line of text may be edited by using the COPY key to copy individual words from the original line of text, by using the

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ERASE key to erase characters from the edited line, and by inputing characters via the keyboard. If the edited line is complete, pressing the NEXT key will position the arrow beneath the next line of text. When the last line is completely edited, pressing the NEXT key will store the response in the #sceneflag. If in the case that no editing needs to be done to a line of text, pressing the NEXT key to move on to the next line of text will simply store the original line of text unaltered.

An exception exists in the cases of 'scenin' and 'diasin'. On these displays, no items are available to be selected, however the entire response is displayed with an arrow beneath one line of the text. Operation of the editing keys (COPY, ERASE, NEXT) works exactly as it did in the other cases as explained above.

Upon completion of editing of a display, the BACK key must be pressed to return the program back to the title page display, at which point another display may be chosen to be edited, a subject may be entered to run a diagnostic test, or the program terminated by pressing SHIFT-STOP.

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ADDING A NEW DIAGNOSTIC SCENARIO

Access "osunaset" and follow its directions to lengthen a nameset file

Lengthen the file "scenefle" by one part for each new scenario added

Press the BACK key repeatedly to exit "osunaset"

Access "scenefle" and press SHIFT-STOP to edit the file as data

Follow the directions to add a new name to this nameset file

Allocate 73 records to the newly created name

Press BACK key repeatedly to exit "scenefle"

Execute "edife3" and operate in its editing mode to input the responses for the new scenario, as explained in changing an existing diagnostic scenario. Note that all responses are originally blank until you store a response for each query.

The router menu page must be changed to accomodate the increased number of diagnostic scenarios. This is done by modifying the router's source code.

Appendix G

Contents of Symposium On

Aviation Psychology

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Proceedings of the

SYMPOSIUM ON AVIATION PSYCHOLOGY

April 21 and 22, 1981

The Aviation Psychology Laboratory
The Ohio State University
Columbus, Ohio

Convener: R. S. Jensen

Sponsored by:

The NASA Ames Research Center
The Association of Aviation Psychologists
Battelle, Columbus Laboratories

FORWARD

This volume contains the proceedings of the First Symposium on Aviation Psychology conducted by the Aviation Psychology Laboratory of the Ohio State University in Columbus Ohio on April 21 and 22, 1981 sponsored by the NASA Ames Research Center, The Association of Aviation Psychologists, and Battelle, Columbus Laboratories. The Technical Monitor was Dr. John Lauber of the NASA Ames Research Center. It contains complete manuscripts of most of the papers presented at the meeting and abstracts of the others. It also contains three papers submitted for the proceedings and not presented at the meeting. The papers were grouped by subject areas closely following their order of presentation in the program.

The objective of this symposium was to critically examine the impact of high technology on the role, responsibility, authority, and performance of human operators in modern aircraft and air traffic control systems. Our theme was "Aviation Psychology since Paul Fitts: Is Advancing Technology Ignoring Human Performance in Aviation Systems?" Human engineering principles set forth by Paul Fitts for aviation systems were used as the basis for an examination of modern ground and airborne display and control concepts as they relate to human perceptual, motor, and decisional performance, operator selection and training requirements, and crew coordination.

The role of the human operator in man-machine systems has been changing throughout the history of automation. Because new systems frequently require information processing rates and prediction accuracies far exceeding man's capabilities, a tempting alternative is to limit man's role to supervisor and to use a servo as the active control element. Generally, it is more difficult to find solutions that enhance man's capabilities as the system controller. Furthermore, because of their lack of experience with human information processing systems, engineers are less inclined to seek such solutions (Singleton, 1976). Consequently, man is being given a supervisory role consisting of planning, teaching, monitoring, and intervening (Sheridan, 1976).

One of the best examples of the changing role of the human operator in a man-machine system is that of the pilot of a modern airplane. Continuing demands for improved safety, efficiency, energy conservation, and noise reductions with increasing traffic flow have led to increasingly complex systems and control tasks. More and more functions are being handled automatically by ground-based and airborne computing systems, and the pilot is taking the role of a system supervisor who exercises "control by exception" authority only. Nevertheless, despite this increasing role of automation, the pilot remains a redundant system element responsible for manual takeover in the "exceptional" event of partial system failure or other unpredictable contingency that requires improvisation.

In actual practice, the pilot's role as a redundant system element is extremely important. The autopilot is useful during the many "hours of boredom," relieving the pilot of needless attention to aircraft control tasks. However, the autopilot has not been very useful during the "moments of stark terror"(Kennelly, 1970). At the first indication of unusual circumstances (e.g., traffic avoidance, frequent flight path changes,

partial system failure, turbulence penetration, passenger discomfort, wind shear, etc.) the pilot's initial action is to disengage the autopilot, whether or not such action is needed. Thus, the autopilot has proved to be most used when the pilot workload levels are low and least used during many periods of high cockpit workload.

In a 1951 report for the NRC entitled, "Human Engineering for an Effective Air-Navigation and Air Traffic-Controller System," Paul Fitts set forth a number of longstanding principles concerning the effective allocation of tasks to men and machines that are studied in human factors classrooms to this day. Among the principles established by Fitts and his colleagues were the following:

1. Human tasks should provide activity.
2. Human tasks should be intrinsically motivating.
3. Machines should monitor humans, not the converse.

Although the tasks of pilots and air traffic controllers at that time were largely "manual" in comparison to today, Fitts could foresee the possibility of conflicts in man-machine task allocations as automation developed.

In our day, the unquestioned motivation behind virtually every technological advancement in the cockpit is "workload reduction". As a result, we have combination control-wheel steering, auto-throttle, and autopilot systems that permit the pilot to assume control of the system at any level in the control hierarchy. A pilot can program his flight on the runway in Paris, take off and touch only push-button controls until he taxis off the runway in New York. His "workload" is "reduced" under normal flying conditions to the level of a living room observer of Monday night football.

As a result of these "advances", the task assigned to the pilot may be inadequate considering the Fitts principles. The pilot's task requires almost no physical activity, it fails to be intrinsically motivating, and it amounts to a task of monitoring a machine rather than the converse. Thus, the only conditions under which the pilot is overloaded are those cases in which his equipment is degraded. The effect may have been to reduce the pilot's task in normal conditions to a level beneath what Fitts considered adequate without helping and perhaps even hurting his manual control capabilities during flight under degraded conditions.

In addition to the problems of continuous control that are introduced, automation tends to change the requirements for complex decision-making, operator selection and training, and crew coordination. There is a real need at this time for a critical examination of the impact on our aviation system of "engineering solutions" before they find a "problem" that may not exist. The 1981 Symposium on Aviation Psychology initiated this examination in a series of paper sessions given by experts in the field.

Richard S. Jensen

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* Not Presented at Meeting
** Abstract Only

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COCKPIT INFORMATION SYSTEMS

PILOT JUDGMENT

1981 SYMPOSIUM ON AVIATION PSYCHOLOGY
at the Holiday Inn "on the Lane"
Columbus, Ohio

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Sponsored by

The OSU Aviation Psychology Laboratory
The Association of Aviation Psychologists
The NASA Ames Research Center

Monday, April 20

19:00	Reception -- Clark Room Sponsored by Battelle, Columbus Laboratories	

Tuesday, April 21

Plenary Session
Moderator: Dr. Richard Jensen, Director
The Aviation Psychology Laboratory
Room: Sheridan and Custer

08:45	Opening Remarks	Dr. Marion Smith, Associate Dean, College of Engineering Dr. Ann Reynolds, Provost
09:15	Keynote Address "Aviation Psychology Since Paul Fitts"	Dr. Conrad Kraft Boeing Aerospace Company
10:00	Coffee	
10:30	Invited Address "Monitors of Human Performance"	Dr. John Senders University of Toronto
11:00	Invited Address "Within Cockpit Communication Patterns and Flight Crew Performance"	Dr. Clayton Foushee NASA Ames Research Center
12:30	Lunch	

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Training I
Moderator: Dr. Merv Strickler, Former Director of the FAA Aviation Education Programs Division
Room: Sheridan

13:00	"Simulation Technology and the Fixation Stage"	Dr. Ed Stark Singer/Link
13:30	"Development and Application of Air Combat Performance Assessment Methods"	Mr. Anthony Ciavarelli Dunlap & Associates

Tuesday, April 21, Con't.

13:50	"The Navy's Tactical Air Combat Training System (TACTS)"	Lt. Gerald Stoffer Naval Training and Equipment Center
14:10	"The Air Force's Simulator for Air-to-Air Combat (SAAC)"	Lt. Col. Joe Robinson Luke Air Force Base
14:30	"Operator Skill Retention in Automated Systems"	Dr. Dennis Beringer University of Wisconsin
15:00	Coffee	

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Cockpit Information Systems: Models, Displays, and Controls
Moderator: Dr. John Riesing, AF Flight Dynamics Laboratory
Room: Custer

13:00	"1951 - 1981: A Personal Perspective"	Dr. Malcolm Ritchie Wright State University
13:30	"PROCRU: A Model for Analyzing Flight Crew Procedures in Approach to Landing"	Dr. Sheldon Baron Bolt, Beranek and Newman
13:50	"Intrail Following During Profile Descents with a Cockpit Display of Traffic Information"	Ms. Sherry Chappell Dr. Everett Palmer NASA Ames Research Center
14:10	"Preliminary Evaluation of an On-board Computer-based Information System"	Ms. Sandra Rouse Dr. Bill Rouse University of Illinois
14:30	"General Aviation Cockpit Design Features Related to Inadvertent Landing-Gear Retraction Accidents"	Dr. Al Diehl FAA, Washington Office
15:00	Coffee	

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Vision - Visual Perception
Moderator: Dr. Dean Owen, Ohio State University
Room: Sheridan

15:30	"Landing Airplanes, Detecting Traffic, and the Dark Focus"	Dr. Stan Roscoe New Mexico State Univ.
15:50	"The Dark Focus of Accommodation and Pilot Performance"	Dr. Russ Benel Dr. Thomas Amerson, Jr. The Essex Corp.

16:10	"Functional Optical Invariants: A New Methodology for Aviation Research"	Dr. Rik Warren Dr. Dean Owen Ohio State University
16:30	"Fractional Rates of Change as Functional Optical Invariants"	Ms. Sue Mangold Dr. Dean Owen Dr. Rik Warren Ohio State University
16:50	"ATC System-Induced Pilot Error: Human Factors and Legal Considerations"	Mr. Frank Fowler Fowler and Associates

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Pilot Judgment I
Moderator: Dr. Jerry Berlin, Embry Riddle Aeronautical University
Room: Custer

15:30	"Instructional Design for Aircrew Judgment Training"	Dr. Fritz Brecke Veda, Inc.
15:50	"Planning Behavior of Pilots in Abnormal and Emergency Situations"	Dr. Gunnar Johannsen Institut fur Anthropotechnik, Germany Dr. Bill Rouse University of Illinois
16:10	"Decision Making During Critical Inflight Events"	Mr. Bill Flathers, MITRE Dr. Tom Rockwell Dr. Walt Giffin Ohio State University
16:30	"Airmanship - An Introduction"	Mr. Amir Mane University of Illinois
16:50	"A Civil Aviation Training Program to Improve Pilot Judgment"	Dr. Jerry Berlin Dr. Charles Holmes Embry Riddle Aeronautical University

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19:00 Banquet at Holiday Inn in Sherman Room
Speaker: Dr. Richard Anderson
Professor of Geology and Mineralogy
The Ohio State University
Title: "Energy Alternatives"

Wednesday, April 22

Cockpit Monitoring Concepts
Moderator: Dr. Malcolm Ritchie
Room: Sheridan

08:30	"Fitt's Principles Still Applicable: Computer Monitoring of Cockpit Emergencies"	Dr. John Reising W-P Air Force Base
08:50	"Intelligibility of and Pilots' Reactions to Various Types of Synthesized Speach"	Dr. Evelyn Gora Technical University of Munich
09:10	"A Retrospective Examination of the Performance of Warning Devices in Avoiding Controlled-Flight-Into Terrain (CFIT) Accidents"	Mr. Jim Loomis and Mr. R. F. Porter Battelle, Columbus Laboratories
09:30	"The Effects of Alert Prioritization and Inhibit Logic on Pilot Performance"	Mr. David Po-Chedley Douglas Aircraft Corp.
09:50	"Computer Aided Decision Making"	Mr. Bill Allen Stanford University
10:10	Coffee	
10:30	"A Comparison of Tracking with Visual and Kinesthetic Tactual Displays"	Dr. Richard Jagacinski Mr. John Flach, Dr. Richard Gilson Ohio State University
10:50	"Ergonomics Aspects in Cockpit-Layout"	Dr. Walter Sperr, Consultant Mech. Engineering Vienna Dr. Helfried Aubauer Hinterbruhl, Austria
11:10	"PAVE LOW III Interior Lighting Reconfiguration for Night Vision Goggle Compatibility"	Dr. Lee Griffin W-P Air Force Base
11:30	"Head Up Displays in Operation: Some Unanswered Questions"	Mr. Richard Newman Crew Systems Consultants Mr. Bill Welde AFAMRL
11:50	"Uses of Stereographic Displays in Aircraft Cockpits"	Ms. S. Joy Mountford Mr. Ben Somberg Honeywell

Wednesday, April 22, Con't.

Training II
Moderator: Dr. Stanley N. Roscoe, New Mexico State University
Room: Custer

08:30	"Adaptive Models in Training"	Dr. Stan Trollip M. Richard Anderson University of Illinois
09:00	"Towards an Internal Model in Pilot Training"	Mr. B. Braune Dr. Stan Trollip University of Illinois
09:30	"The Tomorrow Learning Machine"	Mr. Webb Caster Aviation Simulation Technology, Inc.
10:00	Coffee	
10:30	"Measures of Effectiveness to Evaluate a Prototype GA Inflight Simulator"	Dr. Berry Strauch Embry Riddle Aeronautical University
10:50	"Computer Modeling of Realistic Terrain Models"	Dr. Chuck Csuri Ohio State University

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Pilot Judgment II
Moderator: Dr. Jerry Berlin, Embry Riddle Aeronautical University
Room: Sherman

10:30	Round Table Discussion "Pilot Judgment Training and Evaluation"	W. Flathers, MITRE R. Jensen, OSU T. Rockwell, OSU W. Giffin, OSU F. Brecke, Veda, Inc. R. Benel, Essex Corp. M. Strickler A. Diehl, FAA

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Pilot Selection
Moderator: Dr. Sergie Kochkin, United Airlines
Room:

13:30	"Individual Differences in Multi-Task Response Strategies"	Dr. Diane Damos University of Oregon

13:50	"Validation of a Proposed Pilot Trainee Selection System"	Lt. Col. Jeff Koonce Air Force Academy
14:10	"Sex as a Moderator Variable in the Selection and Training of Persons for Learning Flight Maneuvers"	Maj. Tom McCloy The Air Force Academy
14:30	"Changes in the U.S. Army Aviation Selection and Training Program	Mr. William Brown Dr. J. A. Dohme Dr. M. G. Sanders U.S. Army Research Institute

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Crew Workload, Coordination, and Complement
Moderator: Dr. Clayton Foushee, NASA Ames Research Center
Room:

13:30	"Mental Workload and Visual Scanning"	Dr. Randel Harris NASA Langley Dr. J.R. Tole Dr. A.T. Stephens Dr. A.E. Ephoth MIT
13:50	"Tanker Avionics/Aircrew Complement Evaluation"	Dr. Richard Moss W-P Air Force Base
14:10	"Operational Monitoring in Multi-Crew Transport Operation"	Capt. Harry Orlady United Airlines (Ret.)
14:30	"An Organization Development Approach to Resource Management in the Cockpit"	Mrs. Linda Orlady Rings Ohio State University
15:00	Open House	

THE AVIATION PSYCHOLOGY LABORATORY
355 Baker Systems Engineering

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